Record of Decision

Brown and Bryant
Operable Unit No. 2
Superfund Site
Arvin, California

U.S. Environmental Protection Agency Region 9
San Francisco, California

September 2007

RECORD OF DECISION
BROWN AND BRYANT OPERABLE UNIT NO.2 SUPERFUND SITE

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List of Acronyms

1,2-DCP	1,2-Dichloropropane
1,2,3-TCP	1,2,3-Trichloropropane
1,3-DCP	1,3-Dichloropropane
4,4-DDE	dichloroethylene
ACSD	Arvin Community Services District
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
B&B	Brown & Bryant
bgs	below ground surface
BHHRA	Baseline Human Health Risk Assessment
BRA	Baseline Risk Assessment
Cal/EPA	California Environmental Protection Agency
CBA	Committee for a Better Arvin
CCR	California Code of Regulation
CDFG	California Department of Fish and Games
CDHS	California Department of Health Services
CDPR.	California Department of Pesticides Regulation Endangered Species Project Species degrees
^{o}C	Celsius degrees
CEM	Conceptual Exposure Model
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERES	California Environmental Resource Evaluation System
CHHSLs	California Human Health Screening Levels
cm/sec	centimeters per second
cm^2/sec	square centimeters per second
CMP	Corrugated Metal Pipe
CNDDB	California Natural Diversity Data Base
COCs	Contaminants of Concern
COPCs	Constituents of Potential Concern
CPF	California Cancer Potency Factors
CRPE	Center on Race, Poverty and the Environment
CSFs	Cancer Slope Factors
CSM	Conceptual Site Model
CVRWQB	Central Valley Regional Water Quality Control Board
CW-1	Arvin City Well-1
DBCP	1,2-Dibromo-3-chloropropane
DDT	Dichlorodiphenyltrichloroethane
DMS	Data Management System
DNAPL	Dense Non Aqueous Phase Liquid
DQOs	Data Quality Objectives
DTSC	California Department of Toxic Substances Control
EDB	Ethylene dibromide, also called 1,2-Dibromoethane
EPA	Environmental Protection Agency
EPCs	Exposure Point Concentrations
^{0}F	Fahrenheit degrees
FS	Feasibility Study
Facility	Brown and Bryant Arvin Pesticide Reformulation Facility
ft/ft	foot per foot
gpm	gallon per minute
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
ILCR	Incremental Lifetime Cancer Risk

in/yr	inches per year
IRIS	Integrated Risk Information System
"J"	Estimated value (laboratory qualifier)
Kd	Distribution coefficient
MCL	Maximum Contaminant Level
MCPP	2-(2-Methyl-4-chlorophenoxy) propionic acid
mg/Kg	milligrams per kilogram
MNA	Monitored Natural Attenuation
MULTIMED	Multimedia exposure assessment model
NAPL	Non-Aqueous Phase Liquids
NCP	National Contingency Plan
NPL	National Priority List
OEHHA	Office of Environmental Health Hazard Assessment
OU	Operable Unit
Panacea	Panacea, Inc.
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose Level
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SDWA	Safe Drinking Water Act
Shell	The Shell Chemical Company
SVE	Soil-Vapor Extraction
SVOCs	Semi-Volatile Organic Compounds
T2VOC	modeling code developed by Lawrence Berkeley National Laboratory
TBC	To-be-considered
TAT	Technical Assistance Team
UCL	Upper Confidence Limit
µg/L	microgram per liter
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
UV	Ultraviolet
VLEACH	one-dimensional finite-difference vadose zone leaching model
VOCs	Volatile Organic Compounds

RECORD OF DECISION
BROWN AND BRYANT OPERABLE UNIT NO.2 SUPERFUND SITE
SEPTEMBER 2007

PART 1 DECLARATION

1.1 Site Name and Location

Brown and Bryant Operable Unit No.2
Superfund Site
600 South Derby Street
Arvin, California
CERCLIS Identification No. CAD052384021

1.2 Statement of Basis and Purpose

This decision document presents the selected remedy for the Brown and Bryant Superfund Site (B&B Site) Operable Unit No. 2 (OU-2), Arvin Pesticide Reformulation Facility (Site) located in Arvin, California. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (collectively referred to herein as CERCLA) and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record file for the B&B Site OU-2.

The State of California, acting through the California Department of Toxic Substances Control (DTSC) and the Central Valley Regional Water Quality Control Board (CVRWQCB), concurs with the selected remedy.

1.3 Assessment of Site

The response action selected in this Record of Decision (ROD) is necessary to protect public health or welfare, and the environment from actual or threatened releases of pollutants or contaminants from the B&B Site.

1.4 Description of the Selected Remedy

The remedial action for OU-2 at the B&B Site addresses contaminated groundwater. The overall cleanup strategy for the B&B Site is to reduce contamination in groundwater to protect human health and the environment. The contaminated groundwater in the B-zone above the cleanup levels noted in Part 2, Section 12.4.2 is considered to be a threat to human health and the environment at the Site. The selected remedy reduces the threat of further groundwater contamination within the B-zone groundwater by extracting and treating the groundwater in the shallower A-zone, the source of contamination in the B-zone groundwater. To remove the potential threat to human health, the selected remedy will also use monitored natural attenuation (MNA) in the B-zone groundwater, a potential source of drinking water; placing institutional controls on the Site and nearby properties to prevent the use of B-zone groundwater until such time as drinking water criteria are attained and, relocation of the Arvin City Well CW- 1 to remove the threat of cross contamination from the A-zone and the B-zone to the C-zone as this well has potential to be a conduit. Extraction and treatment of A-zone groundwater was a component of the selected OU-1 remedy. However, additional investigation was necessary for adequate design and implementation of A-zone groundwater remediation component. Therefore, the A-zone groundwater extraction and treatment component of OU-1 selected remedy was not installed but was carried over to the OU-2 to be addressed in

conjunction with actions for the B-zone groundwater. Therefore, this ROD for OU-2 is the Final ROD for the B&B Site groundwater remediation. The major components for the Selected Remedy include:

- Relocation of the Arvin City Well CW- 1: Properly abandon the existing Arvin CW- 1 and relocate a replacement well a suitable distance from the known B&B Site OU-2 plume.

- Installation of an extraction system in the shallow A-zone aquifer with above ground ultraviolet (UV)/oxidation water treatment and disposal of the treated water to the City of Arvin sewer system.

- Monitored Natural Attenuation: Conduct groundwater monitoring of the B-zone to evaluate: 1) the effectiveness of the remedy; 2) the location of the plume; and 3) that remediation goals have been met by natural attenuation in the B-zone. This component will include an MNA performance plan during implementation of the remedy, which will include details of the groundwater monitoring and natural attenuation progress evaluation for the B-zone groundwater. Actual performance of the natural attenuation remedy will be carefully monitored in accordance with the MNA Performance Plan. If monitoring data indicate that the COC levels do not continue to decline, as estimated in the fate and transport model, EPA and DTSC will reconsider the remedy decision.

- Place institutional controls on the Site and nearby properties to limit use of B-zone groundwater.

1.5 Statutory Determination

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative groundwater extraction and treatment technologies to the maximum extent practicable.

The remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through extraction and treatment).

Because the remedial actions at this Site will result in hazardous substances, pollutants, or contaminants in the groundwater remaining on site above levels that allow for unlimited use and unrestricted exposure, and will take greater than five years to attain remedial action objectives (RAOs) and cleanup levels, a statutory review will be conducted within five years after the initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. The information in this ROD is from the Site Administrative Record, primarily from the Final Remedial Investigation/Feasibility Study of Alternatives (RI/FS Report), Operable Unit No. 2, Brown & Bryant Superfund Site, September 2005. Additional information can be found in the Administration Record file for the B&B Site.

- Chemicals of concern and their respective concentrations - Page 2-26;

- Baseline risk represented by the chemicals of concern - Page 2-29;

- Cleanup levels established for chemicals of concern and the basis for these levels - Page 2-55;

- Conclusions that there are no source materials constituting principal threats at the site - Page 2-47;
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD: Page 2-23;
- Potential land and groundwater use that will be available at the site as a result of the selected remedy - Page 2-54;
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected – Page 2-51; and
- Key factor(s) that led to selecting the remedy - Page 2-48.

1.7 Authorizing Signature

Kathleen Salyer, Chief
Superfund Site Cleanup Branch
U.S. Environmental Protection Agency, Region 9

9/28/07
Date

PART 2 DECISION SUMMARY

1.0 Site Name, Location, and Description

This Record of Decision (ROD) is for the Brown and Bryant Operable Unit No.2 (OU-2) Superfund Site (hereafter referred to as "the site" or "B&B Site") located at 600 South Derby Road in Arvin, Kern County, California, (CERCLIS Identification Number CAD052384021) approximately 18 miles southeast of the city of Bakersfield (Figure 1-1). The site covers approximately 5 acres and is bordered on the east by irrigated agricultural fields on the north, and to the south by food packing and shipping facilities, and on the west by a residential area. Two schools (Gospel Tabernacle of Arvin and Stepping Stones Child Care Center) and a park (Bear Mountain Recreation and Park Center) are within 0.5 mile of the site. The Morning Star Preschool, at 416 North Hill Street is within 1 mile of the site. The site is currently vacant and secured by a chain-link fence. An engineered bituminous pavement covers the entire site and acts as a Resource Conservation and Recovery Act (RCRA) cap on the Site's southern portion and as a non-RCRA cap in the Site's northern portion. The structures currently present within the fenced area are an aboveground storage tank (Tank UN-32), a warehouse, an open metal shed, and groundwater monitoring wells.

The lead agency for the B&B Site is the United States Environmental Protection Agency (EPA). The California Department of Toxic Substance Control (DTSC) and the Central Valley Regional Water Quality Control Board (CVRWQCB) serve as support agencies. Currently, the remedial activities are funded by EPA. Although potentially responsible parties have been identified, no settlement has been reached with these parties at this current date.

2.0 Site History, Enforcement Activities, and Previous Investigations

The Brown & Bryant Pesticide Reformulation Facility (Facility) in Arvin operated as a pesticide reformulator and custom applicator facility from 1960 to 1989. This facility formulated agricultural chemicals including pesticides, herbicides, fumigants, and fertilizers. In 1981, the Brown & Bryant Facility was licensed under the RCRA as a hazardous waste transporter. Contamination of soil and groundwater resulted from inadequate procedural controls, chemical spills during operations, and leaks from a surface wastewater pond and sumps.

Inspections by the CVRWQCB have documented numerous instances of poor facility operations and maintenance practices during Brown & Bryant's occupancy of the Site. Described in more detail below, an onsite tank holding the chemical dinoseb, and two unlined ponds for pesticide rinse water were noted as being potential contaminant release areas. One 250,000-gallon pond was noted as overflowing twice. The onsite tank, 560,000 gallons in capacity, is also reported to have leaked. In 1984, the California Department of Health Services (CDHS) identified various pesticides in onsite wells, including 1,2-dibromo-3-chloropropane, ethylene dibromide, dinoseb, 1,2-dichloropropane, and chlorobenzene.

The largest releases onsite were from a waste pond, a sump area, and a dinoseb spill area (Figure 1-1). The waste pond in the southwest portion of the site was originally excavated as an unlined earthen pond in 1960. The pond was used to collect runoff water from the yard and from two sumps (since excavated). The pond was also used to collect rinse water from rinsing tanks used for spraying fumigants. Excess pond water and rainwater runoff also collected in a topographically low area to the east and south of the pond. In addition, water collecting on the Site from precipitation and irrigation occasionally breached the berm in the southeast corner of the site and drained into the pond. The pond was double lined with a synthetic liner in November 1979. The liner and additional soil were excavated in August 1987. Approximately 640 cubic yards of soil that showed visible signs of contamination were removed from the pond and disposed offsite at that time. The depths of this excavation ranged from approximately 1.5 feet on the sides to 5 feet near the center.

Figure 1-1, Location and Site Maps of Brown and Bryant Superfund Site

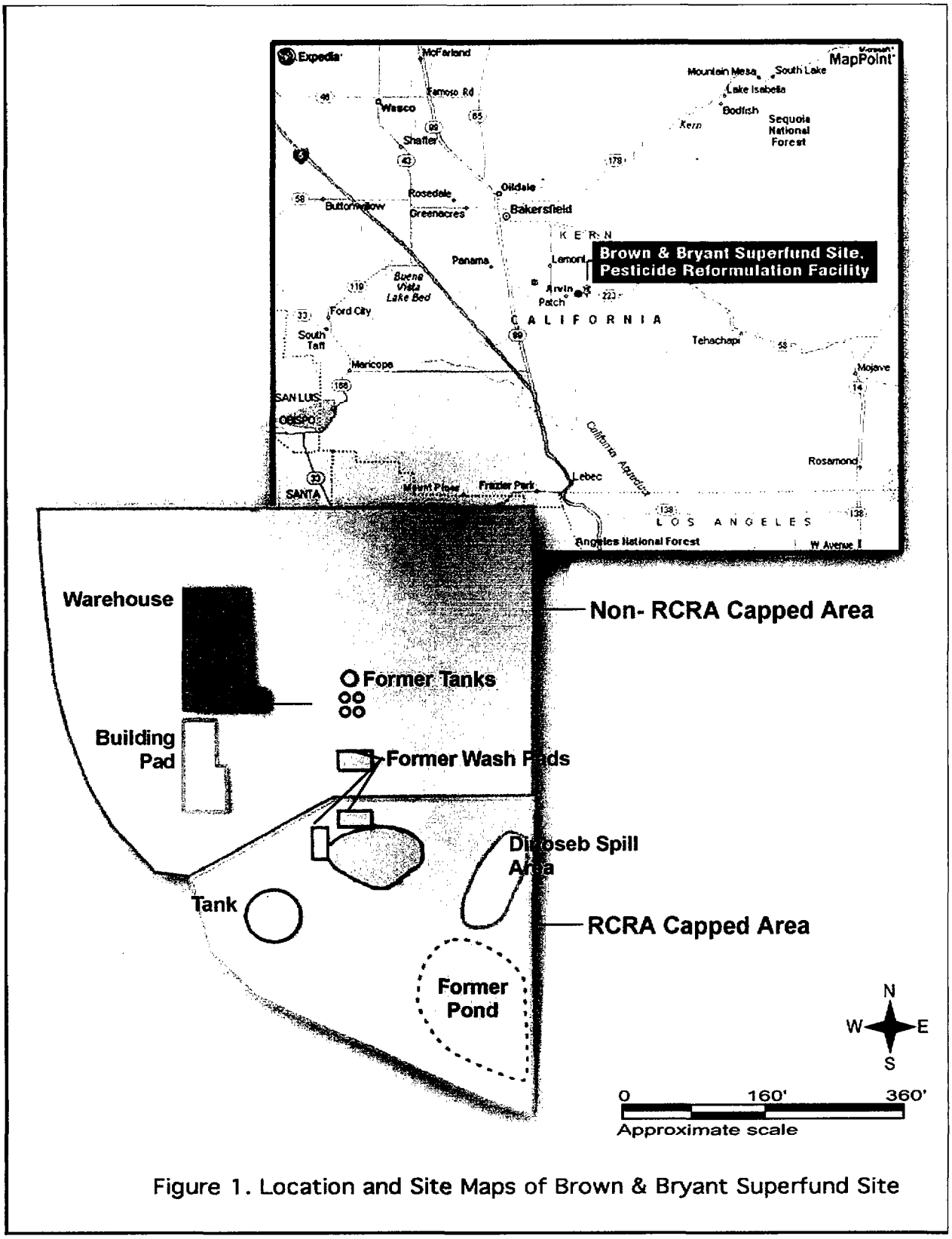


Figure 1. Location and Site Maps of Brown & Bryant Superfund Site

In 1960, an unlined earthen sump was constructed in the center of the site. The sump was used to collect wash water from a pad where equipment and tanks used for liquid fertilizers and fumigants were washed. Water from the sump was drained to the pond through an underground pipeline. In 1980, the unlined sump was replaced with two double-lined sumps.

Dinoseb was stored in a smaller tank storage area along the eastern fence, just north of the pond. In 1983, there was a significant dinoseb spill in this area. As a result, the soil and groundwater underlying this portion of the site has been reported to contain the highest concentrations of dinoseb. EPA excavated highly contaminated soil from this area in the mid 1990s.

In 1989, the site was listed on the National Priorities List (NPL). Subsequently, various emergency and removal actions were initiated, which include the following actions, to minimize or eliminate immediate threats to human health and the environment:

- Several small soil stockpiles consisting of approximately 80 cubic yards that were identified to contain dinoseb-contaminated soil were removed.

- All concrete within the Site, except for the concrete slab contiguous with the warehouse building, was demolished and transported to a central location for washing to remove soil adhering to the concrete. About 175 cubic yards of the twice pressure-washed concrete was removed for off-site disposal. The rinsate water from the concrete washing was collected and pumped to tank UN-32 for subsequent treatment and disposal.

- Approximately 570 cubic yards of asphalt covering Site areas was removed and was placed in the former waste pond area.

- A 1,200-gallon UST located at the southeast corner of the warehouse structure was excavated and removed from the Site to the Safety Kleen/Laidlaw facility in Buttonwillow, California. Soil testing in the excavation indicated that the contaminant concentrations were acceptable for closure.

- Storage containers in the warehouse including drums, vessels, and a 1,200-gallon plastic tank, were emptied, triple-rinsed and properly disposed of. Liquid within the containers was pumped to tank UN-32 tank for subsequent treatment and disposal. Soil was removed to the former waste pond. Plastic drums, vessels and overpacks were cut up after rinsing and then disposed of off-site.

- Tank UN-32 was used to collect liquid generated during the OU-1 remedial actions. It's ancillary equipment and handrails associated with the existing structures at tank UN-32 were demolished and disposed of off-site after high-pressure washing to remove soil and potential surface contamination. Tank UN-32 at the site contained approximately 280,000 gallons of material: 268,000 gallons of liquid and 12,000 gallons of sludge. Tank UN-32 contents consisting of tank liquid, rinsate, and sludge (4 bins) were transported to Dome Rock Industries, Inc. Class 1 landfill in Arizona for disposal. The interior of the tank was triple rinsed and washed with high-pressure water after removal of the sludge. All rinsate was vacuumed using a Supersucker vacuum hose for temporary storage in bins. The sides of the tank were cleaned with a squeegee to remove all liquid used in the cleaning process. Confirmatory wipe samples of the interior tank walls were taken, which indicated that the tank cleaning was completed.

- A 200-foot-long rail spur that serviced the Site from the south was removed. The rails were pressure washed to remove soil. The cleaned rails were cut to 10-foot sections for off-site disposal

and salvage. The wood rail ties were removed and hauled to the Safety Kleen/Laidlaw facility in Buttonwillow.

- The warehouse building interior was pressure washed and cleaned.

- A RCRA cap consisting of a geosynthetic clay liner and protective asphalt covering was constructed in the southeastern part of the Site covering an area of approximately 60,000 square feet. A non-RCRA cap consisting of a 3-inch-bituminous course on a 6-inch compacted subgrade was constructed on all Site areas not covered by the RCRA-cap. The entire Site within the perimeter fence is covered by a cap.

- A new 6-foot high chain-link fence was constructed around the southern portion of the Site in the area of the RCRA cap, the new injection wells, and tank UN-32. This new fence runs approximately 1,100 linear feet.

The site is currently vacant. A warehouse, an open metal shed, and an above ground storage tank are on the property. The property is secured by a chain-link fence and paved with asphalt. The asphalt acts as a RCRA cap in the site's southern portion, and a non-RCRA cap in the site's northern portion.

EPA has divided the site into two operable units. The first operable unit (OU-1) consists of the original source area of contamination (facility waste pond, tanks, sump area and the dinoseb spill area), the surface soils, the subsurface soils to the first water bearing unit (A-zone soils, and the first water bearing unit, the A-zone groundwater located approximately 65 to 70 feet below ground surface (bgs). The ROD for the OU-1 was signed on November 8, 1993. The selected OU-1 remedy included extraction and treatment of the A-zone groundwater. However, based on design studies and additional information collected during the remedial action phase of the project, the A-zone groundwater extraction and treatment was not installed. The pump test information indicated that A-zone groundwater yield was not sufficient and sustainable for traditional extraction and treatment. Action in the A-zone was carried forward to be addressed in conjunction with the B-zone groundwater in the second operable unit (OU-2). The actions in the 1993 OU-1 ROD for A-zone groundwater were interim actions. The actions selected in this OU-2 ROD are the final actions for groundwater remediation.

The OU-2, the subject of this ROD, includes subsurface soil from the base of the A-zone groundwater to the second water-bearing unit (B-zone groundwater), and the B-zone groundwater.

Subsurface investigations conducted onsite to date during the OU-1 and OU-2 have confirmed the presence of a number of potentially hazardous substances in the groundwater. Fifty-six organic compounds were found within the A-zone groundwater samples and 11 were found in the B-zone groundwater samples. The primary chemicals of concern (COCs), which were detected during the OU-1 investigation are:

- Chloroform;
- 1,2-dibromo-3-chloropropane (DBCP);
- 1,2-dichioropropane (1,2-DCP);
- 1,3-dichloropropane (1,3-DCP);
- l,2,3-trichloropropane (l,2,3-TCP);
- Ethylene dibromide (EDB); and
- Dinoseb.

The contamination in the A-zone perched groundwater poses a potential threat to the underlying unconfined regional aquifer (B-zone), and the confined C-zone aquifer that is used for municipal drinking

water. Public and private wells within 3 miles of the Site provide drinking water to 7,200 people and irrigate 19,600 acres of croplands. Arvin City Well No.1 (CW-1) is 1,500 feet down gradient from the site.

3.0 Community Participation

The September 2005 Final Remedial Investigation/Feasibility Study of Alternatives (RI/FS Report) and the Proposed Plan for the B&B Site OU-2 were made available to the public in June 2007. They can be found in the Administrative Record file and the information repository maintained at the Arvin Branch of the Kern County Library, 123 A Street, Arvin, California 93203, and the EPA Superfund Record Center, 95 Hawthorne Street, San Francisco, California. In addition, EPA distributed the Proposed Plan fact sheets to individuals on the mailing list, which consisted of over 900 addresses. Two public meetings were conducted, June 21, 2007 and August 9, 2007, during the public comment period in the City of Arvin where the proposed plan was presented and comments were accepted from the public. The notice of the June 21, 2007 public meeting was published in the *Bakersfield Californian* on June 14, 2007, and in Spanish language in *El Popular* on June 15, 2007. The notice of the August 9, 2007 public meeting was published in the *Arvin Tiller* on August 1, 2007, in the *Bakersfield Californian* on August 3, 2007, and in Spanish language in *El Popular* on August 3, 2007. All materials, including the Proposed Plan Fact Sheet and meeting discussion were held in both English and Spanish. An EPA representative went door to door on August 8, 2007 handing out the Site Fact sheet. The public comment period was extended from 30 days (June 21, 2007 to July 21, 2007) to 67 days (June 21, 2007 to August 28, 2007). Extensions of the public comment period were published in the *Arvin Tiller* on July 25, 007 and August 22, 2007; in the *Bakersfield Californian* on August July 21 and August 24, 2007; and in Spanish language in the *El Popular* on July 20, 2007 and August 24, 2007. EPA received written comments from the community during the public comment period for the Proposed Plan. The public comments are addressed in the Responsiveness Summary in Part 3 of this document.

4.0 Scope and Role of Operable Units or Response Action

As discussed previously, EPA has divided the site into two operable units (OUs). The OU-1 includes the original source area of contamination, the surface and sub-surface soils, and the A-zone groundwater plume. Extraction and treatment of A-zone groundwater was a component of the selected OU-1 remedy. However, additional investigation was necessary for adequate design and implementation of A-zone groundwater remediation component. The pump test information indicated that A-zone groundwater yield was not sufficient and sustainable for traditional extraction and treatment. Therefore, the A-zone groundwater extraction and treatment component of OU-1 selected remedy was carried over to the OU-2. The OU-2 includes the deeper B-zone subsurface soils and the B-zone groundwater unit. The response actions selected in this ROD address the A-zone groundwater, the carried over task from the selected OU-1 remedy, and B-zone groundwater in OU-2, and constitutes the final remedy for these groundwater zones and the B&B Site.

The remedial action objective for the site is to protect human health and the environment from the conditions in the subsurface that have been identified in the remedial investigation. For OU-2, there are two primary pathways: 1) potential exposure to groundwater within the B-zone; and 2) exposure to groundwater within the C-zone. The C-zone is a potable water source with numerous Arvin City wells completed in this zone. Arvin city well No.1 (CW-1) is approximately 1500 feet down-gradient and closest drinking water well to the site. It is the only city well that has the potential to be significantly impacted by the COCs within the A-zone and B-zone originating from the B&B Site.

The primary objective for the OU-2 response action is to reduce and control migration of the contamination from the A-zone groundwater to the deeper B-zone and C-zone groundwater. The A-zone groundwater

extraction and treatment is a carried forward task that is considered in the B&B Site OU-2 FS and presented in the Proposed Plan as a remedial alternative in conjunction with monitored natural attenuation for the B-zone groundwater and discontinued use and relocation of the Arvin City Well CW- 1 in the C-zone. Based on measured water production rates, the A-zone groundwater is not classified as a potential drinking water source. The B-zone groundwater is not a current exposure route, as it is not being used as a drinking water source; however, it is classified by the CVRWQCB as a potential drinking water source because it is capable of yielding sufficient water. Therefore, one part of the OU-2 response action and cleanup goal is to reduce the contamination levels in the A-zone to levels that would protect the B-zone groundwater from further contamination. The A-zone groundwater has contributed to COC levels in the B-zone groundwater to exceed maximum contaminant levels (MCLs) set by EPA. Remediation in the B-zone will address potential exposure pathways of ingestion of groundwater from this zone. The specific remedial action objective for OU-2 is to attain drinking water MCLs in the B-zone groundwater and to prevent or control migration of COCs from the B-zone to C-zone wells and to adjacent drinking water sources.

5.0 Site Characteristics

5.1 Conceptual Site Model

The conceptual site model (CSM) presented on Figure 5-1, is based on the following exposure pathways: 1) ingestion, dermal contact, and inhalation of groundwater contaminants; 2) ingestion and direct contact with surface and subsurface soil; 3) inhalation of airborne contaminants in outdoor air originating from soil; and 4) inhalation of indoor air contaminants originating from soil and groundwater contamination. The receptors include the on-site maintenance worker, the on-site commercial/industrial worker, off-site residents (adult and child), and an off-site commercial/industrial worker. Assumptions applied to these pathways include: 1) pavement, concrete, buildings, and other existing cover that could be removed to expose the underlying soil and 2) groundwater wells would be completed in the B-zone aquifer underneath the B&B Site and the water would be used as an untreated drinking water source. The deeper drinking water aquifers underlying the B&B Site have not been impacted by contamination above drinking water standards; however the potential exists that contamination could migrate downward into these aquifers and adversely impact municipal water supplies. The concentration levels of soil and groundwater contaminants used in the risk assessment are based on the average (95% upper confidence limit) or the maximum concentrations detected during the remedial investigation. There are no ecological habitats or ecological exposures at the B&B Site. The exposure pathways depicted in the CSM are discussed further in Section 7.1.2.

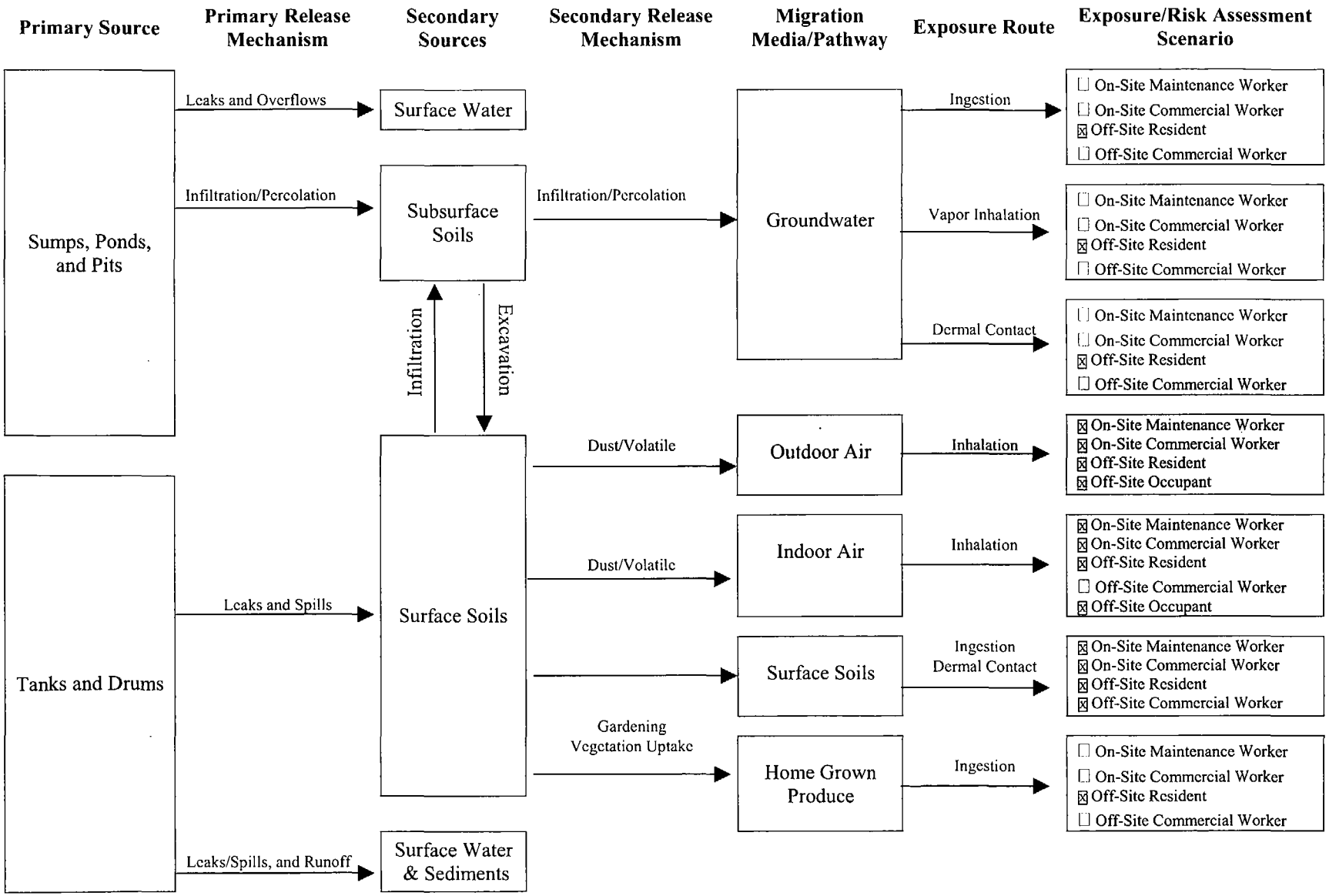
5.2 Overview of Brown and Bryant Site

The B&B site is located at 600 South Derby Street in the City of Arvin, California, approximately 18 miles southeast of the City of Bakersfield (Figure 1-1). Arvin is primarily an agricultural community and the Site is located in a light industrial and commercial area within the city.

The Site is located on the east side of Derby Street, north of its intersection with Franklin Street. The Site covers approximately five acres and is a generally rectangular, fenced-in parcel that is elongated towards the southeast Union Pacific's railroad siding track serving the area that runs along the western and southern boundaries of the Site outside of the fenced area. The track was in use until 1975 to ship bulk products via rail to the site.

Arvin is situated in the Tulare river basin on the southeastern edge of California's Central Valley Mountains. Arvin has an average elevation of 440 feet above sea level. The site is topographically flat with only a slight slope towards the south. The Site is bordered on the east by irrigated agricultural fields, on the

Figure 5-1
Brown and Bryant Superfund Conceptual Site Model



north and south by food packing and shipping facilities, and on the west by South Derby Street, which is a paved two-lane highway separating the Site from a residential area to the west.

5.3 Surface and Subsurface Features

The Site is currently vacant and secured by a chain-link fence. An engineered bituminous pavement covers the entire Site and acts as a RCRA cap in the Site's southern portion and as a non-RCRA cap in the Site's northern portion. The structures currently present within the fenced area are an aboveground storage tank (Tank UN-32), groundwater monitoring wells, a warehouse, and an open metal shed as shown on Figure 1-1.

Surface water runoff from irrigation of adjacent agricultural land to the east runs onto the Site and sometimes ponds on the ground surface of the Site. In some locations, this surface water flow occurs towards the south and southeast off the site. During wet seasons, some ponding of rainwater has been observed on the non-RCRA cap in the northern portion of the Site. This ponding is due to the uneven topography of the Site and the constructed grade of the engineered non-RCRA cap in this area. The cap is currently being repaired and the Site is being surveyed so that the cap can be regraded to drain properly.

The Site is located within the southernmost portion of the San Joaquin Valley at an elevation of approximately 440 feet above mean sea level. The San Joaquin Valley is a broad structural downwarp bordered on the east by the granitic complex of the Sierra Nevada and on the west by the complexly folded and faulted Coast Ranges. The top of the basement complex of the Sierra Nevada block dips gently westward beneath the valley. Late Cenozoic continental deposits form the floor of the valley and attain a maximum thickness of 16,000 feet near the south edge of the valley in the Site vicinity.

The continental deposits in the Site vicinity are primarily of fluvial (river) origin but contain extensive interbeds of lacustrine (lake) origin. The fluvial deposits consist of lenticular bodies of silt, sand, and gravel deposited in stream channels, and sheet-like bodies of silt and clay laid down on flood plains by slow moving overflow waters.

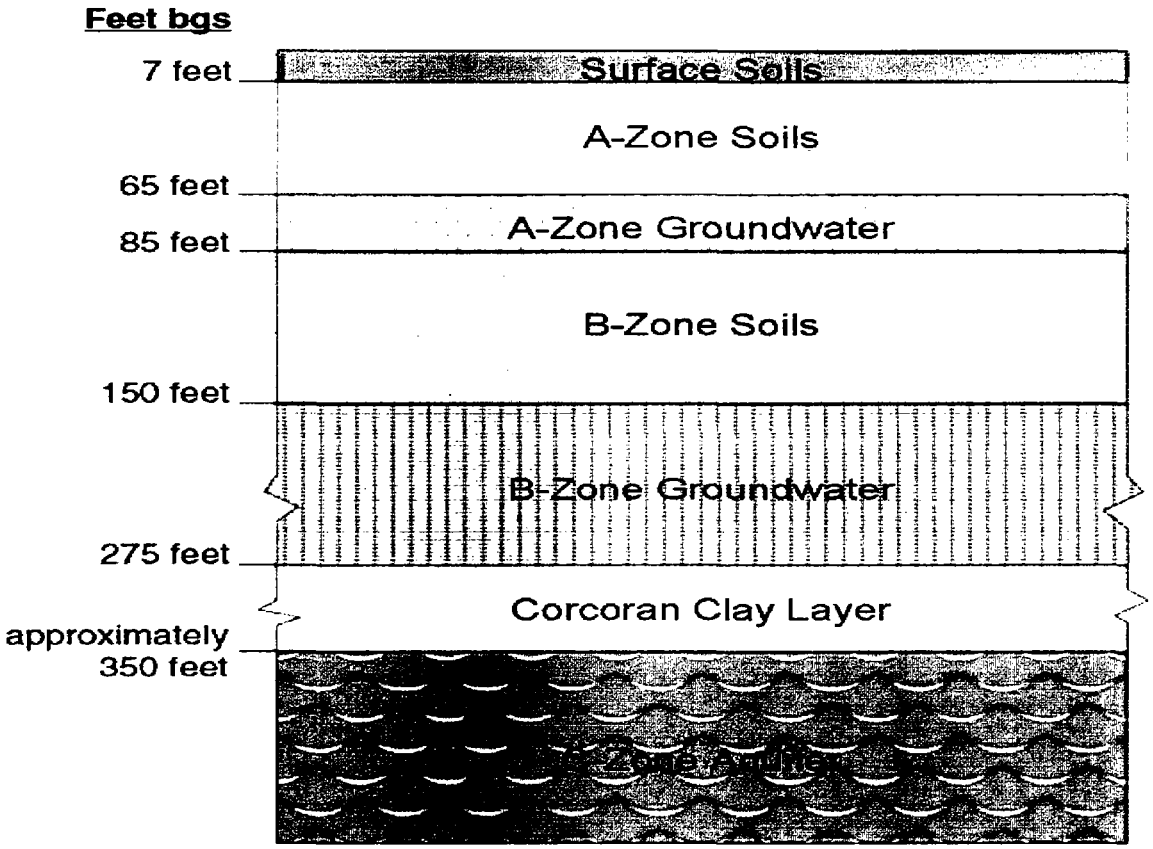
The alluvial deposits beneath the Site vicinity are divided into three units: (1) an upper unit of clay, silt, sand, and gravel (mostly alluvial-fan), and flood-plain deposits of heterogeneous character; (2) a middle unit consisting of a relatively impermeable diatomaceous lacustrine clay (the Corcoran Clay member of the Tulare Formation); and (3) a lower unit of clay, silt, sand, and some gravel, in part lacustrine in origin. The upper and middle units are Pleistocene age, and the lower unit is of Pleistocene and Pliocene age.

The Site is located approximately 2.4 miles northwest of the White Wolf Fault. The last activity along this fault was in 1952 and resulted in a magnitude 7.5 earthquake (the Arvin-Tehachapi earthquake) that caused 4.2 feet of uplift in the Tehachapi Mountains. There was a magnitude 5.0 earthquake 17.1 miles East of Arvin on September 29, 2004. Following this event, water levels in all wells were measured and compared to the January 2004 groundwater sampling event. Water levels in each well were nearly identical showing that there was no impact on the groundwater at or near the site from this event.

The Site hydrogeology has been divided into three zones (A-zone, the B-zone, and the C-zone) with respect to site conditions, as shown in Figure 5-2. The A-zone begins at the ground surface and extends vertically to the bottom of the first saturated zone. Where this saturated zone is absent, the separation between the A-zone and the B-zone is estimated at 85 feet bgs (below ground surface). The B-zone begins at the bottom of the A-zone and ends at the top of the Corcoran Clay Member. The C-zone begins at the top of this clay member and its thickness is several hundred feet to over 1,000 feet.

The depth to the saturated A-zone varies between 65 and 75 feet bgs according to recent water level measurements in the monitoring wells within and adjacent to the Site. The A-zone groundwater occurs primarily beneath the southern portion of the Site, but the clay layer at the base of the zone discontinues (becomes thinner) between 500 and 600 feet south of the Site. The layer is also not found within 200 feet east and 300 feet west of the Site. Saturated thickness of the A-zone groundwater ranges approximately from 0 to 10 feet and varies seasonally as water level fluctuates in this zone. Groundwater in the A-zone flows in a generally southwesterly direction. Periodic and localized changes in flow directions occur beneath the Site. Several groundwater depressions exist south of the Site toward which groundwater flow occurs. These groundwater depressions provide pathways for vertical flow of groundwater from the A-zone into the B-zone. The soils under the A-zone, and at the top of the B-zone, are unsaturated to a depth of approximately 140 feet, where the top of the saturated B-zone occurs. The horizontal groundwater velocity in the A-zone has been estimated at 53 feet/year. An average hydraulic conductivity of $1.6x10^{-4}$, an effective formation porosity of 26 percent, and a groundwater gradient of 0.034 is reported for the A-zone. A yield of less than 100 gallons per day can be expected for wells in the A-zone. This rate cannot be sustained for more than a few hours at a time and recovery times for the wells is several days.

Figure 5-2, Brown and Bryant Superfund Site Soil Layering System
(Reproduced from the B&B Site RI/FS Report Figure I-6)



The B-zone includes unsaturated soil beneath the A-zone and the second-water-bearing unit (B-zone groundwater) starting at 140 to 165 feet bgs. The base of the B-zone is at the top of the Corcoran Clay located at a depth of approximately 275-300 feet bgs. The alluvial soil types within the B-zone are similar to those encountered within the A-zone and consist of mixtures of clay, silt, sand, and gravel layers. The

sandy layers in the B-zone are thicker and more extensive than in the A-zone. The presence of this clay layer has been confirmed in well logs from the water supply wells off site; however, the geologic correlation between the B-zone clay layer and clay layers identified in the water supply wells has not been geologically confined. The B-zone groundwater comprises a series of water-bearing units. The direction of flow in these units is generally toward the south to southwest, with a relatively flat gradient of approximately 0.0004 foot per foot (ft/ft). Transmissivity of the B-zone has been estimated to be 2.66 square centimeters per second (cm^2/sec) and the hydraulic conductivity is estimated to be about $8.7x10^{-3}$ centimeters per second (cm/sec). The average groundwater velocity is calculated to be 15 feet/year with an effective porosity value of 0.25. Permeability values within the B-zone are much higher than those reported for the A-zone. Wells screened in the B-zone could be pumped at 7 gpm for an extended period. The reason for the higher permeability of the B-zone aquifer is the abundance of sandy layers and inclusion of some gravel lenses or strings. The B-zone aquifer is essentially considered to be semi-confined, but locally may consist of several confined/unconfined aquifers, which are separated by relatively continuous clay layers of varying thickness.

The Corcoran Clay, also locally known as the "blue clay" or the "E-Clay" is a member of the Tulare Formation and is the predominant aquitard separating the semi-confined water bearing layers above it and the confined aquifer beneath. It is a regionally extensive lacustrine deposit of low permeability ranging in thickness from 20 feet to over 100 feet. Based on the driller's log for city well CW-1, see Figure I-8, RI/FS Report, it is estimated that the Corcoran Clay layer in the area of the site is at least 27 feet thick. The drinking water for the city of Arvin is supplied by the Arvin Community Services District. Arvin's drinking water source is groundwater from five active wells, between 300 to 700 feet deep. These active wells include Arvin city Wells 1, 5, 6, 7, 8, and 9 all of which are located within less than 1-mile radius from the site. Arvin city well No. 1, the closest drinking water well is located approximately 1,500 feet south-southwest of the site, see Figure I-3 of the RI/FS Report.

5.4 Sampling Strategy

The B&B Site has been subject to several investigations to assess the nature and extent of contamination. Summaries of the site investigation are provided below and have been categorized according to their operable unit (OU-1 or OU-2).

The study area for the OU-1 investigations included surface soil, the unsaturated A-zone, and the A-zone groundwater. The A-zone includes unsaturated soils below ground surface (bgs), which may vary in thickness from 65 to 85 feet, and the first water-bearing unit, the A-zone groundwater. The depth to the saturated zone varies between 65 and 75 feet bgs in recent groundwater depth measurements. The base of the A-zone is a thin sandy clay layer between 75 and 85 feet bgs. The clay layer and A-zone groundwater occur beneath the entire Site but disappear between 500 and 600 feet south of the Site, 200 feet east of the Site, and 300 feet west of the Site, see Figure I-7, RI/FS Report.

The study area for the OU-2 investigation includes the unsaturated zone beneath the A-zone aquifer and the B-zone aquifer. The B-zone includes unsaturated soil beneath the A-zone and the second lowest water-bearing unit (B-zone groundwater) at 140 to 165 feet bgs. The B-zone extends to at least 250 feet bgs and ends at a clay layer (known as the Corcoran Clay) that confines the drinking water aquifer (the C-zone) beneath it.

OU-1 INVESTIGATIONS

From 1983 through 1988, the Brown and Bryant Facility conducted several soil and groundwater investigations and remedial actions under CDHS supervision The most significant work included the

installation of 10 monitoring wells and the removal of some heavily contaminated soil beneath the two sumps and waste pond.

The Brown and Bryant Facility hired two engineering firms to conduct the Site investigations. During these investigations, soil and groundwater beneath the Site were investigated. Soil impacted with COCs was also removed during one of these investigations.

During the site investigations, on-site soils were collected and analyzed for organics and trace metals. The results of the analyses indicated high concentrations of pesticides in soil generally within the first few feet of the ground surface to greater depths in portions of the Site. The higher concentrations in the soil appeared to be located beneath the chemical handling areas that are thought to be contamination sources areas. These areas include the former sump location, former waste pond, and location of the dinoseb spill.

Four monitoring wells (MW-1, MW-2, MW-3, and MW-4) were drilled and completed. Soil samples were collected during drilling of the borings for these wells. A total of 27 soil samples were collected from the deeper portions of the borings and were analyzed for some or all of the following tests: soil moisture retention (American Society for Testing and Materials [ASTM] D 3152), moisture content (ASTM D 4643), total organic carbon (USEPA 415.1), particle-size analysis (ASTM D 422), and effective porosity (triaxial flexible wall method). In addition, three groundwater extraction wells were installed (EW-1, EW-2, and EW-3) at the southern portion of the proposed RCRA cap and two injection wells were installed (IW-1 and IW-2) north of the proposed RCRA-capped area (approximately 175 feet up-gradient from the extraction wells. An aquifer test report was prepared that summarizes the results of tests conducted on the extraction and injection wells. The objective of the aquifer tests was to characterize the shallow aquifer (A-zone) in the dinoseb contamination area for potential and successful remediation using pump-and-treat technologies.

A pilot soil-vapor extraction (SVE) was also performed as part of the OU- 1 remedial studies. The purpose of the pilot study was to evaluate the effectiveness of contaminant removal efficiency prior to installation of the SVE remedial action.

During investigations conducted for OU- 1, the B-zone was briefly studied, although formal investigations for OU-2 did not begin until early 2000. Geophysical data were analyzed from six deep boreholes (CB-01, CB-02, CB03, CB-04, CB-05, and CB-06). The geophysical logs contained information on the structural composition of the subsurface soils and sands. This information was used to determine the most permeable layers within the B-zone and make recommendations on the locations for new B-zone monitoring wells.

Quarterly monitoring samplings have been performed from the period of July 2000 through February 2003. The purpose of quarterly groundwater monitoring of wells in the A-Zone and B-Zone was to evaluate the changes of the seven COCs and other chemicals concentration over time, and to assess the groundwater flow in each zone. Beginning in July 2000, a total of 16 wells in the A-zone, 7 wells in the B-zone, and the city well CW-1 were sampled. The quarterly monitoring samplings as of February 2003 included the sampling of 24 wells in the A-zone, 12 wells in the B-zone, and the City Well CW-1.

OU-2 INVESTIGATIONS

The results pertinent to the OU-2 RI of the site are the well construction data, soil characteristics of samples and the chemical concentration of organics and metals for soil samples. This data was collected from the well boring of Phase I and Phase II investigations and are briefly described below.

The primary objectives of the OU-2 investigation were to define the spatial extent of the COCs at the site

and its vicinity and to collect physical parameters for fate and transport analysis. Several volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) including 1,2,3-TCP, DBCP, EDB, 1,2-DCP, chloroform, acetone, Bis (2-ethylhexyl) phthalate, 2-methylnaphthalene, and methyl chloride were detected in relatively low concentrations in some of the collected and analyzed samples from A and/or B unsaturated zones. Herbicides and pesticides including dinoseb, 4,4-DDT, and MCPP were also detected in some of the collected and analyzed soil samples. As many as 13 metals were detected in some of the samples collected during these investigations.

Phase I

Ten wells were drilled from November to December 2001 to more completely characterize the B-zone aquifer and extent of contamination in this zone. Pre-well completion activities included collecting soil samples from eight of the new well locations during drilling. Groundwater from the wells was sampled 1 to 2 weeks after installation and quarterly thereafter. With the exception of one well PWB- 1 located on-site, all of these wells were located off-site to the south or east of the site.

Soil borings for the A-zone were drilled to a total depth of 85 feet; and the B-zone wells were drilled to total depths from 160 to 185 feet bgs, depending on the depth where water was encountered. Wells PWA-1 and PWA-5 were drilled to depths of 85 feet without the collection of soil samples. Soil samples were collected during the installation of Wells PWA-2, PWA-3, PWA-4, and PWB-1 through PWB-5. Continuous samples were collected from Borings PWB- 1 and PWB-2, and the remaining borings/wells were sampled at 5-foot intervals to the total depth of the borings, starting at *5* feet bgs. Soil samples were analyzed using EPA Methods 8260B (for VOCs), 8270C (for SVOCs), 8151A (for Herbicides), 8081A (for Pesticides), and 6000/7000 (for metals) and for soil characteristics.

Soil samples from each boring were also tested for moisture content, dry density, and grain-size distribution curve by ASTM D 422, and hydraulic conductivity by ASTM D5084. Also, laboratory tests were conducted on selected samples at various depths to estimate unsaturated moisture-characteristic properties, relative permeability, and distribution coefficient (batch adsorption test).

Phase II

In January and February 2003, eight more monitoring wells were installed, all wells off-site (two completed in the A-zone - PWA-6 and PWA-7, and six in the B-zone aquifers - PWB-6 through PWB-11) to complement the OU-2 investigations of the Site. These additional wells were drilled to further characterize the B-zone, the extent of the A-zone aquifer, the extent of the COC plumes off-site, and to verify the conceptual hydrogeologic model used for the fate and transport analysis.

In addition, three shallow soil borings were drilled and sampled for laboratory analysis of VOCs, SVOCs, herbicides, pesticides, and metals. The purpose of drilling these borings was to further define the extent of the COC off-site for health risk assessment purposes. The results of the laboratory analysis were reported in the quarterly groundwater sampling and analysis report for February 2003.

Two additional groundwater monitoring wells in the B-zone south and southeast of the Site were installed in January and September 2006. Well PWB-7A was installed to replace well PWB-7 due to damaged well casing after installation. Well PWB-12 was installed to assess the extent and concentrations of COCs south and southeast of the Site. Groundwater sampling at these two wells was performed during 2006 and January 2007. The sampling results were provided in the February 2007 Monitoring Well Installation Report for PWB-7A and PWB-12.

5.5 Known and Suspected Sources of Contamination

The suspected sources of contamination of soil and groundwater include chemical spills and leaks from a surface wastewater pond and sumps at the Site. The largest releases on-site were from a waste pond, a sump area, and a dinoseb spill area (Figure 1-1). The Brown and Bryant Facility operated as a pesticide reformulator and custom applicator facility from 1960 to 1989. The Brown and Bryant facility mixed agricultural chemicals, including pesticides, herbicides, fumigants, and fertilizers to meet their customer needs. In 1981, the B&B facility was licensed under the RCRA as a hazardous waste transporter.

The waste pond on the southwest portion of the Site was originally excavated as an unlined earthen pond in 1960. The pond was used to collect runoff water from the yard and two sumps (since excavated). The pond was also used to collect rinse water from rinsing tanks used for fumigants. Excess pond water and rainwater runoff also collected in a topographically low area to the east and south of the pond. In addition, water collecting on-site from precipitation and irrigation from the east has occasionally breached the berm in the southeast corner of the site and drained into the pond. The pond was double-lined with a synthetic liner in November 1979 by the facility owners.

In 1960, an unlined earthen sump was constructed in the center of the Site. The sump was used to collect wash water from a pad where equipment and tanks used for liquid fertilizers and fumigants were washed. Water from the sump was drained to the pond through an underground pipeline. In 1980, the facility owners replaced the unlined sump with two double-lined sumps (USEPA, 1993a).

Dinoseb was stored in a tank storage area along the eastern fence, just north of the pond. In 1983, there was a significant dinoseb spill in this area. As a result, the historical soil and groundwater underlying this portion of the Site were reported to contain the highest concentrations of dinoseb.

Between 1983 and 1988, investigations were conducted at the B&B Site to evaluate the nature and extent of chemicals in the soil and groundwater. Limited cleanup work began under the supervision of the CDHS. In 1989, the B&B facility ceased operations.

5.6 Types of Contamination and Affected Media

Facility operations at the B&B Site have resulted in the discharge of contaminants to the surface and subsurface soils, and certain contaminants have penetrated the groundwater in the A-zone and the unsaturated soils and the groundwater of the B-zone. Several VOCs, SVOCs, herbicides and pesticides were detected in some of the soil samples. The principal COCs for the B&B Site identified during the OU-1 investigation are:

- Chloroform,
- 1,2-dibromo-3-cliloropropane (DBCP),
- 1,2-dichloropropane (1,2-DCP),
- 1,3-dichloropropane (1,3-DCP),
- 1,2,3-trichloropropane (1,2,3-TCP),
- Ethylene dibromide (EDB), and
- Dinoseb.

COCs identified for OU-2 are the same as those identified for OU-1.

5.7 Location of Contamination and Potential Routes of Migration

5.7.1 Surface Water Contamination

Surface water contamination is not an issue for the Site OU-2. Surface water runoff and infiltration may potentially contribute to the mobilization of the contamination that is left in the subsurface soils within the A-zone and in the unsaturated portions of the B-zone. However, the RCRA and non-RCRA cap covers the Site and restricts the mobilization of surface water contamination. Therefore, surface water issues are not being considered for OU-2,

5.7.2 Soil Contamination

Surface soils were tested for hazardous and nonhazardous metals. Some organic compounds were detected and consisted of VOCs, SVOCs, and dinoseb. Dinoseb was the only COC detected in the surface soils and was detected at a frequency greater than five percent. Several VOCs and SVOCs including 1,2,3-TCP, DBCP, EDB, 1,2-DCP, chloroform, acetone, Bis (2-ethylhexyl) phthalate, 2-methylnaphthalene, and methyl chloride were detected in relatively low concentrations in some of the collected and analyzed samples from A and/or B unsaturated zones. Herbicides and pesticides including dinoseb, 4,4-DDT, and 2-(2-Methyl-4-Chlorophenoxy) propionic acid (MCPP) were also detected in some of the collected and analyzed soil samples.

The initial investigations of the Site (OU-1) included soil sampling and analysis. Sampling results from surface soils identified dinoseb as the only COC. Dinoseb was detected at concentrations exceeding 7,000,000 µg/kg. The extent of dinoseb concentration was investigated from 1 to 7 feet bgs. Four areas were identified as having the highest concentrations of dinoseb and include two locations along the east fence line (including the dinoseb spill area), the northeast corner of the Site, and east of the large storage tank (Tank UN-32). At least one soil sample in each area exceeded the health-based cleanup level for dinoseb, set at 80 milligrams per kilogram (mg/kg). The peak concentration of dinoseb impact occurred in a former spill area along the east fence-line and beneath a former pond and sump. The impacted surface soil was removed and an asphalt cap installed over the entire site. This cap limits or eliminates surface water infiltration, the soil contamination within the A-zone was considered stabilized, requiring no further action.

According to the baseline risk assessment, the risk from soil under its existing conditions is minimal and within acceptable limits. Therefore, there does not appear to be any need for any further remediation of the soil at this Site. Previous (OU-1) remedial actions of the soil have removed or contained the soil contamination. Disturbance of these contained contaminated areas beneath the Site is expected to pose more health risk to the workers attempting to remove the soil than continued containment.

5.7.3 Groundwater Contamination

The subsurface investigations at the Site for OU-1 and OU-2 included groundwater sampling in the A-zone, B-zone and C-zone since September 1987.

A-zone Groundwater

The A-zone groundwater is about 75 feet bgs. There are currently 24 groundwater monitoring wells completed in the A-zone as shown in Figures 5-3 and 5-4. The A-zone groundwater is interpreted to be a perched zone, with a saturated zone up to about 10 feet thick, overlying a silty clay zone a few feet thick. Groundwater in the A-zone flows in a generally southerly direction. The A-zone groundwater is laterally discontinuous, extending several hundred feet east, south and west of the B&B Site footprint.

Figure 5-3
Extent of 1,2-DCP Contamination Above MCL in the A-zone Groundwater At the B&B Site

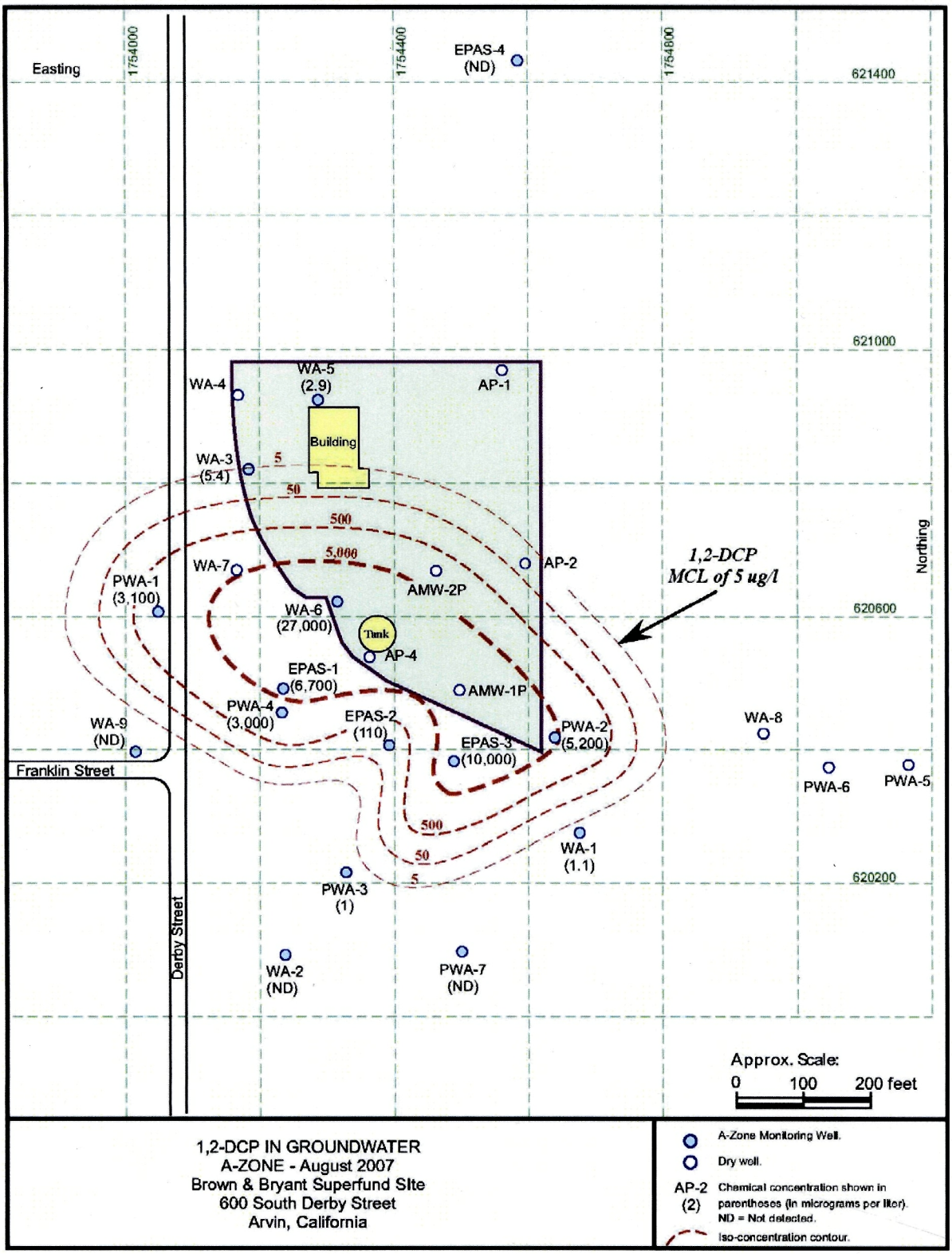
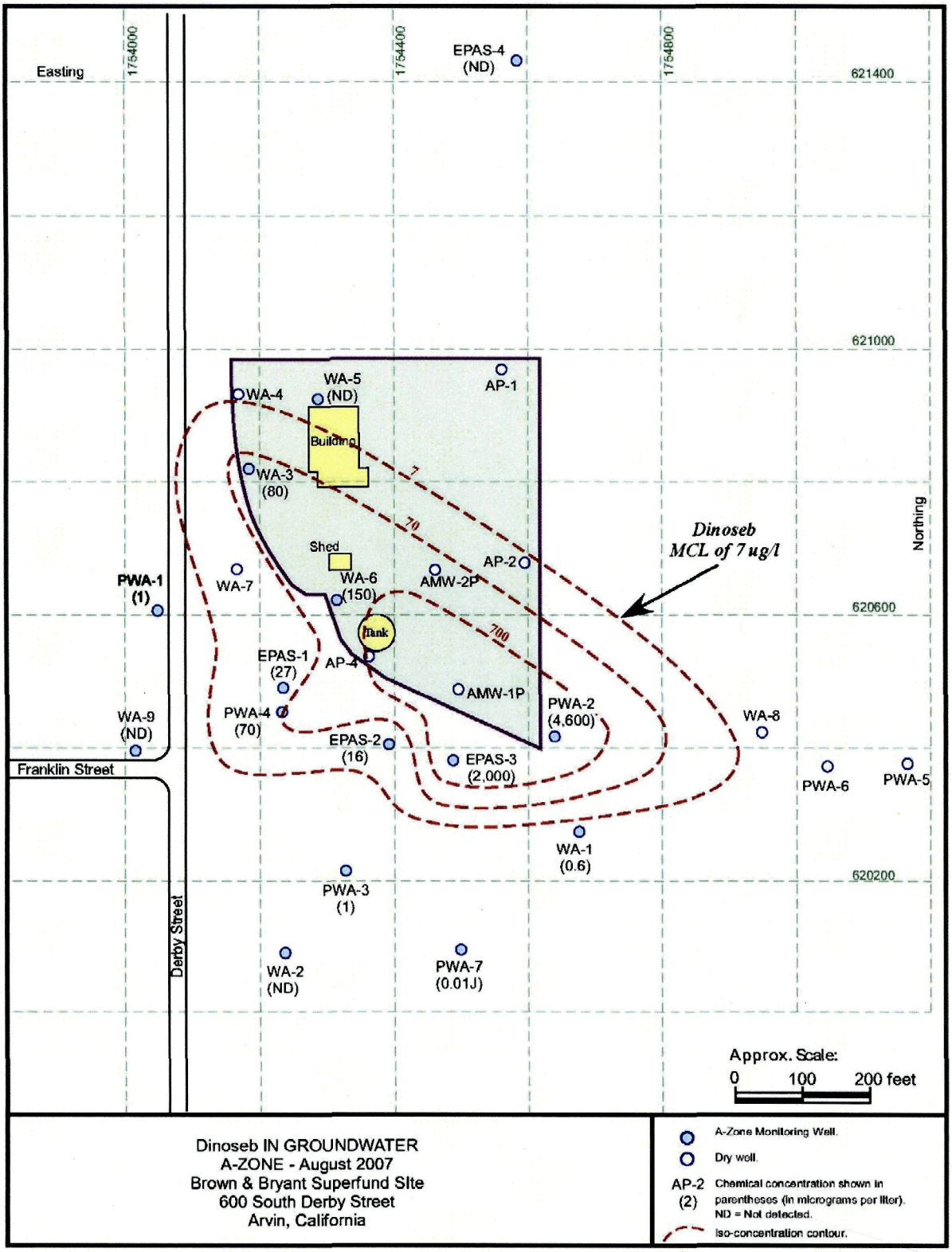


Figure 5-4
Extent of Dinoseb Contamination Above MCL in the A-zone Groundwater At the B&B Site



Wells installed in this zone yielded only 0.25 gpm, although a greater discharge rate may be possible from wells in this zone south of the Site. The A-zone groundwater is not current or potential source of drinking water. The A-zone groundwater percolates vertically into the B-zone.

Out of 24 monitoring wells, only 11 of these have shown the presence of a few non-COC chemicals. However, their concentrations are far below their respective MCLs. Up to 13 metals were detected in the some of the samples collected during these investigations. With the exception of mercury, the reported metal concentrations are within the general range for naturally occurring in soil in Southern California. In the A-zone groundwater, the COCs consistently detected include dinoseb, 1,2-DCP, 1,3-DCP, 1,2,3-TCP, EDB, DBCP, and chloroform. Contamination at the Site was noted to consistently occur at significant concentrations in onsite wells AMW-1P, AMW-2P, AP-4 and WA-6, and offsite wells PWA-2, EPAS-1, EPAS-2, EPAS-3, and WA-7.

Onsite Wells AMW-1P and AMW-2P had the highest average concentrations for six (chloroform, dinoseb, EDB, 1,2,3-TCP, 1,2-DCP and 1,3-DCP) of the seven COCs. Well WA-2 had the highest concentrations of chloroform in July 2001. Offsite well EPAS-3 had the highest concentration of DBCP. Well AMW-2P had the second highest average concentrations for chloroform, 1,2-DCP, 1,2,3-TCP, and DBCP. Wells EPAS-2, AP-4, and WA-7 also showed consistently high concentrations. The highest COC concentrations reported from the 13 groundwater sampling rounds from July 2000, when the quarterly sampling was implemented to January 2004, and the most recent groundwater sampling round in August 2007, are summarized in Table 5-1. Eleven A-zone groundwater monitoring wells (AMW-1P, AMW-2P, AP-1, AP-2, AP-3, AP-4, WA-4, WA-7, WA-8, PWA-5, and PWA-6) were found dry during the August 2007 sampling event. Most of these wells are located on-site, except off-site wells WA-8, PWA-5 and PWA-6.

The highest COC concentrations were measured generally in the onsite wells AMW-1P and AMW-2P, except DBCP. However, these wells are currently dry. The highest DBCP concentration was reported in the offsite well EPAS-3, which is located approximately 10 feet south of the southern boundary. On-site well WA-6 and off-site well EPAS-3, which are not dry generally show highest concentrations.

Table 5-1
A-zone Groundwater Highest COC Concentrations from July 2000 to August 2007

COC	A-zone Groundwater Well	Concentration (µg/L[1])			
		Minimum (Date)	Maximum (Date)	Average	Recent (August 2007)
Chloroform	AMW-2P	ND (Feb 02 to May 03)	207 (Oct 00)	182	NS (well dry)
	WA-2	15 (Jan 04)	213 (Jul 01)	137	92
DBCP	EPAS-3	110 (Feb 03)	1,980 (Jul 01)	992	1100
1,2-DCP	AMW-2P	3,800 (Jul 02)	160,000 (May 02)	91,100	NS (well dry)
	WA-6	4,760 (Jul 00)	40,000 (Jan 04)	14,626	27,000
1,3-DCP	AMW-2P	ND (Oct 01 to May 03)	163 (Jul 01)	111	NS (well dry)
	EPAS-3	21 (Aug 07)	106 (Jul 01)	61	21
Dinoseb	AMW-1P	432 (Jul 00)	15,000 (Aug 03)	4,063	NS (well dry)
	EPAS-3	240 (Feb 03)	4,000 (Mar 01)	2,219	2,000
EDB	AMW-1P	0.18 (Oct 00)	75 (Oct 02)	24	NS (well dry)
	EPAS-3	7 (Feb 02)	36 (Jul 01)	23	17
1,2,3-TCP	AMW-2P	1,610 (Jul 00)	8,700 (May 02)	4,815	NS (well dry)
	WA-6	260 (Jul 01)	3,000 (Aug 07)	1,069	3,000

Notes: ND =- Not Detected in Media, NS = Not Sampled
[1] microgram per liter

As shown in Figures 5-3 and 5-4, in the A-zone, the impacted groundwater extends approximately 200 feet east and 400 feet west of the Site, and more than 300 feet south of the Site. The COCs with the greatest areal extent and highest concentrations were 1,2-DCP and dinoseb. COCs were not detected in the A-zone groundwater monitoring well EPAS-4 located approximately 430 feet north of the Site. Figures 5-3 and 5-4 show the latest extent of 1,2-DCP and dinoseb contamination in the A-zone. Each of the compounds have spread southward with some movement in the east and west directions. Concentrations of 1,2-DCP are the highest but they appear to rapidly diminish 200 to 300 feet outside of the Site boundary. Southerly wells at this distance (WA-2 and PWA-7) did not indicate the presence of 1,2-DCP above laboratory detection limits. Chloroform was detected at concentration (92 µg/L) in well WA-2 and represents the furthest extent of contamination within A-zone groundwater. Based on the recent monitoring data, A-zone has dewatered some, and the extent of A-zone groundwater contamination in northeast area has decreased compared to the extent shown in Figures I-13A to I-13F of the RI/FS Report.

B-zone Groundwater

The B-zone groundwater comprises of a series of water bearing units (B-zone aquifer) from 140 to 180 feet bgs. These water-bearing zones consist of unconfined and semi-confined aquifers that vary in characteristics, thickness, and extent in the area of investigation. Several clay layers and/or lenses, ranging in thickness up to 15 feet, separate these water-bearing units. This creates an intermingled system of aquifers within the B-zone that are mostly semi-confined with continuity between the water-bearing layers. The B-zone groundwater flows generally to the southwest with a relatively flat gradient (0.0004 fl/ft), Permeability of the geologic material in the B-zone aquifer is much higher than the geologic material in the A-zone aquifer. Pumping tests indicate that wells screened in the B-zone could be pumped at about seven gpm for an extended period.

There are currently 19 wells completed in the B-zone water bearing units, as shown in Figures 5-5 and 5-6, completed between 140 and 180 feet bgs. Only six of these have shown the presence of non-COC chemicals. However, their concentrations are all below their respective MCLs. The groundwater has been monitored in B-zone wells since 1987. Wells AR-1, AMW-3R, and AMW-4R have been sampled the longest. Wells WB2-1 through WB2-4 has been monitored since 1992. Data for these wells has sporadically indicated the presence of some COCs. These COCs are more consistently found in Wells WB2-1 and WB2-2 than in the other two. Wells PWB-1 through PWB-12 has been installed recently and there have been between two and nine rounds of samples collected from these wells since 2002.

Based on the groundwater sampling since February 2003, at least some COCs were detected at some levels in 18 of the 19 B-zone wells (all except well PWB-6). The MCLs of several COCs (1,2-DCP, 1,2,3-TCP, Dinoseb, DBCP) have been exceeded in several wells:

A-Series Wells (AR-1, AMW-3R, and AMW-4R): Concentrations of 1,2-DCP, DBCP, and EDB above their respective MCLs have been detected in these wells. 1,2-DCP is most consistently detected, with the highest concentrations reported in AMW-4R at 340 µg/L between 1995 and 1998. However, 1,2-DCP concentrations declined to below MCL since 2002 in this well. EDB was detected at above-MCL concentrations in 1994 and has not been detected in sampled water since then. DBCP was detected in all three wells at above-MCL concentrations (maximum of 12 µg/L in well AR-1) in 1995 and has not been detected in sampled water except in well AMW-4R at concentrations below the MCL.

WB-Series Wells (WB2-1 through WB2-4): These four wells have been monitored since 1992. 1,2-DCP was consistently detected in wells WB2-1 and WB2-2 above its MCL. The highest reported concentration (1,700 µg/L) was detected in well WB2-1 in 1992. Concentrations in recent samples from this well were lower than the concentrations observed from 1992 to 1998. The highest concentration of 1,2-DCP reported

Figure 5-5
Extent of 1,2-DCP Contamination Above MCL in the B-zone Groundwater At the B&B Site

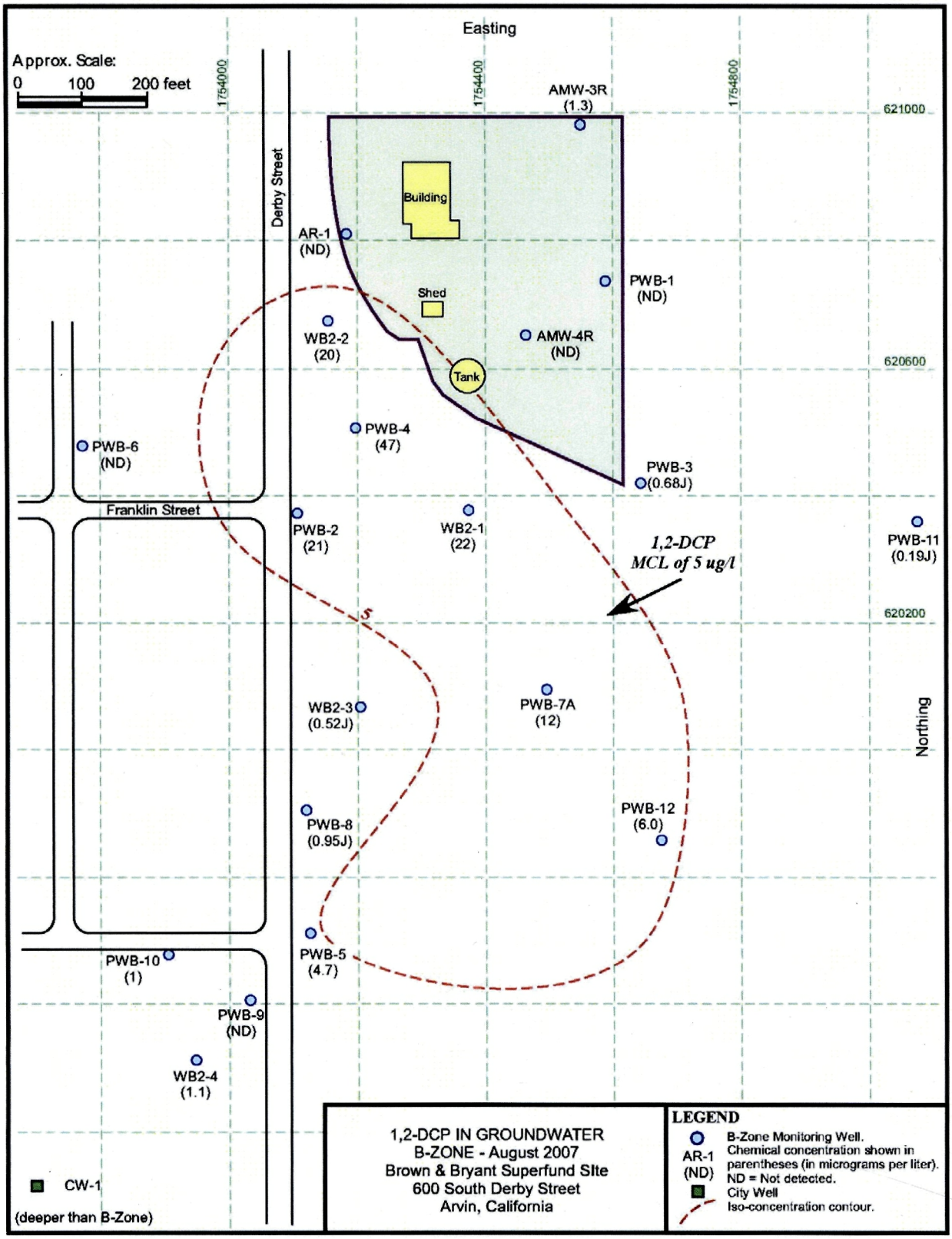
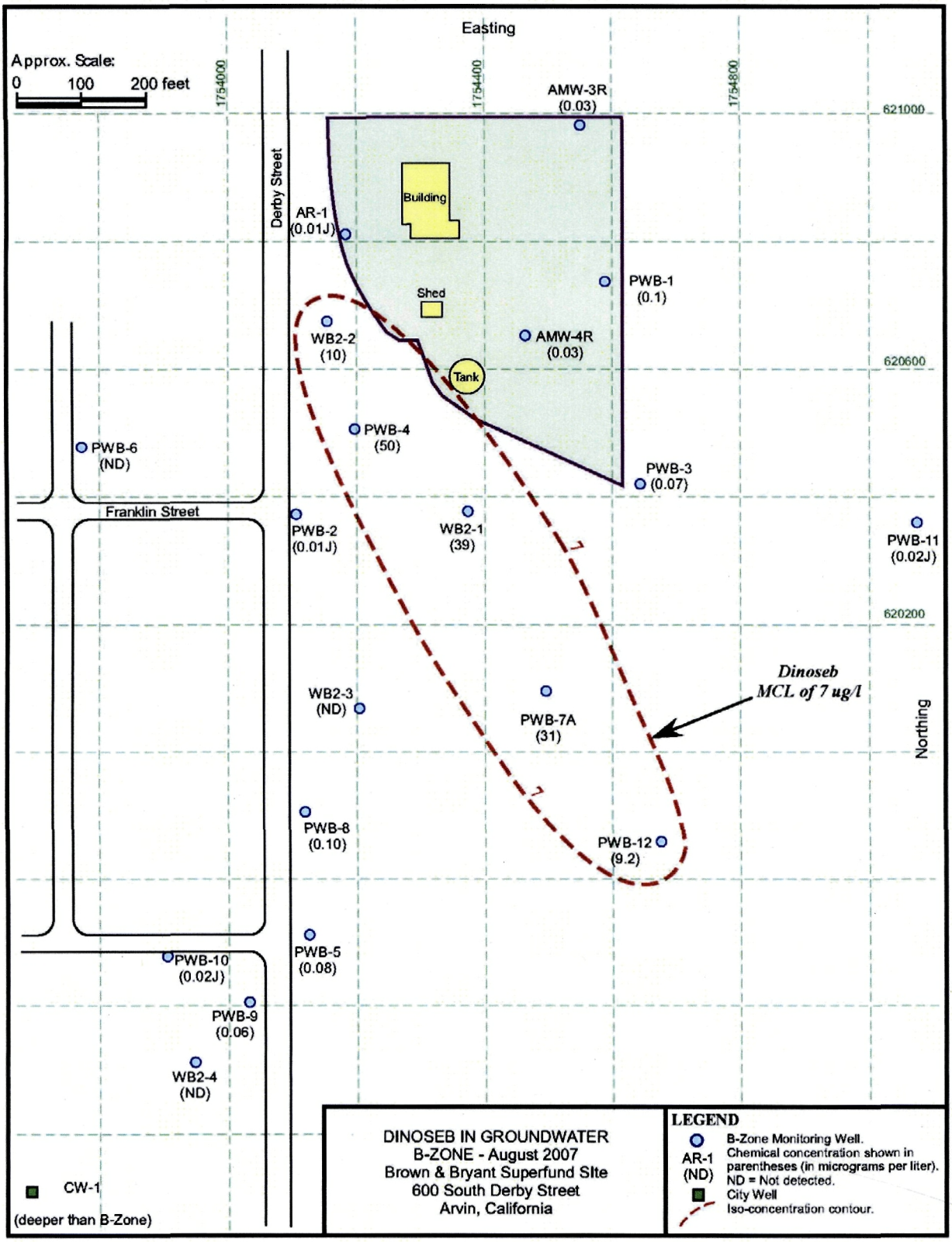


Figure 5-6
Extent of Dinoseb Contamination Above MCL in the B-zone Groundwater At the B&B Site



since 1998 in well WB2-1 was at 120 µg/L in the 2002 sample. Dinoseb has also been observed in this well at concentrations above its MCL since 1998. WB2-1 and WB2-2 are the only WB series wells in which dinoseb has been detected above its MCL. EDB and DBCP were more consistently reported at concentrations above their respective MCLs in the WB Series wells from 1992 through 1997. However, in recent samples from these wells these compounds are either not detected or are below MCLs except at well WB2-2, where DBCP has been detected above its MCL since October 2002.

PWB-series wells (PWB-1 through PWB-12): Five of these wells (PWB-1 through PWB-5) have been monitored since 2002, six wells (PWB-6 through PWB-11) since 2003, and PWB-12 in 2007, providing for nine rounds of samples for five of the wells, five rounds for the six wells, and two round in wells PWB-12. Again 1,2-DCP was found most consistently and was reported above its MCL in wells PWB-2, PWB-4, and PWB-7 and PWB-12. In the February 2003 sample from well PWB-7, highest concentrations were reported for 1,2-DCP at 930 µg/L and DBCP at 130 µg/L. However, the well PWB-7 casing was damaged after installation, and was replaced by well PWB-7A. 1,2-DCP was measured at 12 µg/L and DBCP was measured at 20 µg/L in the replacement well PWB-7A during the January 2007 sampling event. Dinoseb was measured above its MCL in well PWB-4, PWB-7A and PWB-12. DBCP have been reported above its MCL in wells PWB-4, PWB-7A and PWB-12. EDB have been reported above its respective MCLs in wells PWB-3, PWB4, PWB-7A, PWB-8 and PWB-12.

The highest COC concentrations reported from the groundwater sampling of all B-zone wells since July 2000 are summarized in Table 5-2.

Table 5-2
B-zone Groundwater Highest COC Concentrations from July 2000 to August 2007

COC	B-zone Groundwater Well	Concentration (µg/L[1])				
		Minimum (Date)	Maximum (Date)	Average	Recent (August 2007)	MCL[2]
Chloroform	PWB-2	1.7 (Oct 02)	9.8 (Jan 04)	6.3	9.2	80
DBCP	PWB-4	2.6 (Aug 07)	44 (Oct 02)	32	2.6	0.2
1,2-DCP	PWB-4	37 (May 02)	110 (Aug 03	68	47	5.0
1,3-DCP	NA	ND	ND	ND	ND	0.5
Dinoseb	WB2-1	18.2 (Jul 00)	78 (Feb 03)	36.7	39	7.0
EDB	PWB-8	ND	0.07 (Feb 03)	<0.07	ND	0.05
1,2,3-TCP	WB2-1	110 (Jul 00 & Aug 2007)	480 (Oct 02)	249	110	0.5[3]

Note: [1] microgram per liter
[2] Stringent of the Federal or State Drinking Water MCL
[3] Response Level, California Department of Health Services, 1999; and available analytical practical quantification limit for 1,2,3-TCP
ND = Not Detected

All of the wells with highest COC concentration are offsite wells. COC 1,3-DCP has not been detected in well samples during the sampling events from July 2000 through August 2007. The February 2003 sampling results for well PWB-7 are not included in the Table 5-2, as this well casing was damaged when this sample was collected, and is replaced by well PWB-7A.

The COCs with the greatest spatial extent and concentrations above the MCLs are 1,2-DCP and dinoseb, similar to the A-zone. Chloroform at lower concentrations has also been detected over a similar area as the other compounds. The extent of 1,2-DCP and dinoseb above the MCLs are shown in Figure 5-5 and 5-6. The extent of the seven COCs in the B-zone groundwater is summarized below:

1,2-DCP: This compound has been most consistently detected and covers the largest area of the COCs within the B-zone. According to recent sampling data, the above-MCL concentrations extend south and southwest from the site to a distance of about 700 feet. The highest concentrations parallel the southern boundary of the Site and extend approximately 100 feet away from the boundary towards the southwest.

1,3-DCP: This compound has not been detected in any of the B-zone groundwater wells.

1,2,3-TCP: Concentrations above the CDHS Response Level of 0.5 µg/L (up to 340 µg/L) are reported for this compound near the southern boundary of the Site, and extend beyond 900 feet southwest in the same area as the high 1,2-DCP concentrations.

DBCP: The higher concentrations of DBCP are also to the area just south of the southern site boundary. The above-MCL concentrations extend approximately 800 feet south from the Site boundary beyond the well PWB-12.

Chloroform: Chloroform has been detected in many wells monitored. None of the reported analytical results are above the MCL for chloroform.

Dinoseb: Dinoseb, like the other compounds, is found in an area paralleling the southern boundary. The above-MCL concentrations of dinoseb extend to an area approximately 750 feet south of the site boundary pass the well PWB-12.

EDB: EDB has also been detected at above-MCL concentrations in several wells. However, it has been detected only sporadically. EDB has been detected at 0.07 µg/L in well PWB-8, which is approximately 700 feet south of the Site boundary. However, in the most recent round of sampling it was not detected above laboratory reporting limits.

In summary, several of the COCs have been detected in concentrations above their respective MCLs in the B-zone aquifer, and 1,2-DCP, 1,2,3-TCP, DBCP, and dinoseb are most consistently detected in the wells. The COC impacted B-zone groundwater plume has migrated further, compared to the extent of contamination presented in Figures 14A through 14E of the RI/FS Report. The elevated concentrations of the compounds are limited to a 300-foot-wide zone south-southwest of the Site. Only 1,2-DCP and dinoseb at levels above corresponding MCLs appear to have migrated further to a distance of approximately 700 feet south of the Site.

C-zone Groundwater

The C-zone aquifer is located beneath the B-zone aquifer, separated by the Corcoran Clay layer, which in the area of the Site is at least 27 feet thick. It is estimated that the C-zone aquifer is located at a depth of approximately 300 feet bgs. Groundwater-monitoring wells in the C-zone were not installed as part of the Site investigation. The Arvin City well No. 1 (CW-1), which is used for drinking water and is gravel packed constructed well which could be a conduit to the C-zone has been sampled during each quarterly groundwater monitoring event and on a monthly basis in 2003. There have been five instances where a COC was detected in well CW-1. In January 1998, 1,2,3-TCP was detected at 1 µg/L. In February 2002, 1,2,3-TCP was detected at 0.18 µg/L (estimated value). 1,2,3-TCP has not been detected in any other sampling events from this well. In July 2002, dinoseb was detected at 0.29 µg/L. In October 2002, the dinoseb value was rejected due to improper laboratory handling procedures. Analytical results for dinoseb were below its MCL of 7 µg/L. During the August 2007 sampling event, none of the COCs were detected in the City Well CW-1 sample, except dinoseb. Dinoseb was detected below the practical quantification limit (PQL) at an estimated value of 0.02 µg/L. Dinoseb was not detected in the follow up sample collected after three days. This detection of dinoseb was due to the laboratory error. Chloroform was detected in this follow up sample at 2 µg/L, below the 80 µg/L MCL, but not detected in the original August 2007 sample.

The chloroform detection is considered to be a laboratory error. All COCs will be monitored in the follow up sampling events.

The A-zone groundwater is impacted by COCs. Percolation of the groundwater from the A-zone to the B-zone aquifer is continuing and is expected to continue under current Site conditions. Other than sampling of off-site water supply wells screened in the C-zone, no C-zone groundwater investigations were performed because there is a clay layer beneath the B-zone restricting the migration of contamination to C-zone. However, any C-zone well without a properly constructed annular seal through A-zone and B-zone could act as conduit for migration of contamination into the C-zone. The Arvin City Well No.1 (CW-1), the gravel packed constructed well could be a conduit to transport B-zone contamination to the C-zone.

5.7.4 Air Contamination

Because of the cap cover on the Site, the potential airborne migration of the contaminated particles and vapors are mitigated and are not considered to be a concern. Hence, air quality monitoring was not conducted during the investigation. However, soil vapor sampling near the surface soil was performed at four on-site and eleven off-site locations in 2006 to determine any impact of COCs in subsurface soils to the air quality as requested by the DTSC. The sampling results show that no COCs were detected in the off-site soil vapor sampling. Chloroform was detected ranging from 1.9 to 14 ppbv in 8-feet and 15-feet soil vapor samples at four on-site locations. 1,2-DCP was also detected at concentrations ranging from 1.7 to 7.6 ppbv at 8-feet and 15-feet depth at two on-site locations. Some non-COC VOCs were detected in both on-site and off-site soil vapor samples. However, all of the detected constituents in the soil vapor samples were below the California Human Health Screening Levels (CHHSLs).

6.0 Current and Potential Future Land and Water Uses

The B&B site is located in the City of Arvin, California. Arvin is primarily an agricultural community and the site is located in a light industrial and commercial area within the city. The surrounding land uses are anticipated to be of mixed light industrial/commercial gradually changing into agricultural to the east and mixed urban to the south across south Derby Road. Future reasonably anticipated land use options for the B&B Site include light industrial and commercial, which is supported by the current infrastructure that includes highway and railroad access.

The contaminated groundwater under the B&B Site is semi-confined in the upper two aquifers, the A-zone and the B-zone. The A-zone is characterized as shallow groundwater of poor quality with a limited yield, and is not currently used as a drinking water source. The B-zone groundwater is not a current exposure route, as it is not being used as a drinking water source. However, it is classified by the CVRWQCB as a potential drinking water source due to sufficient yield. The C-zone is a potable water source with numerous Arvin City wells completed in this zone. Arvin city well CW-1 is down gradient and closest to the site and has the potential to be significantly impacted by the COCs within the A-zone and B-zone originating from the B&B Site.

The potential for on-site residential land use, which includes groundwater under the B&B Site, as a drinking water source is unlikely, nevertheless, is the most conservative scenario used as a basis for reasonable exposure assessment assumptions and risk characterization conclusion discussed in Section 7.0, Part I of the Site RI/FS Report.

7.0 Summary of Site Risks

EPA completed a Human Health Risk Assessment (HHRA) for the B&B Site. The HHRA estimates the human health and environmental risks that the B&B Site could pose if no action were taken. It is one of the factors that EPA considers in deciding whether to take actions at a site. For the B&B Site OU-2, EPA's decision to take action is based principally on the presence of contamination in groundwater at levels that exceed drinking water standards in the B-zone, evidence that contamination will continue to migrate into groundwater areas that are presently clean or less contaminated, and the potential use of groundwater in and around the B&B Site as a source of drinking water. The risk assessment is also used to identify contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the HHRA for the B&B Site, which can be found in Section 7.0, Part I of the RI/FS Report.

7.1 Summary of Human Health Risk Assessment

This summary of the health risk includes sections on the identification of COCs, the exposure assessment, toxicity assessment, and risk characterization.

7.1.1 Identification of Contaminants of Concern

The COCs driving the need for remedial action (risk drivers) are based on the data collected during the RI between 2000 and 2007. Sampling data was obtained from 55 groundwater monitoring, extraction, and injection wells sampled during this period. A total of seven VOCs, SVOCs, herbicides and pesticides detected in the groundwater contributed significantly to the estimated risks and are considered site COCs. The concentrations of COCs found to pose potential threats to human health and the environment in the groundwater at the B&B Site are presented in Tables 7-1 to 7-4. The tables also identify the exposure point concentrations (EPCs) for soil and groundwater, ranges of concentrations detected for each COC, the detection frequency (i.e., the number of times the chemical was detected in samples collected at the B&B Site), and how the EPC was derived. As shown in the tables, 1,2-DCP, 1,2,3-TCP, 1,2-Dibromo-3-chloropropane, and Dinoseb in the groundwater are the most frequently detected COCs at the B&B Site, and 1,2-DCP, 1,2,3-TCP have the highest EPCs. The principal COCs for the groundwater pathway are 1,2-DCP, 1,2,3-TCP, DBCP, and Dinoseb. Other COCs contributing to the overall risk include Chloroform, 1,3-DCP, and EDB. The Principal COCS for the soil pathway are 1,2-DCP, 1,2,3-TCP, and DBCP.

7.1.2 Exposure Assessment

Exposure refers to the potential contact of an individual (receptor) to a chemical. Exposure assessment is the determination or estimation of the magnitude, frequency, duration, and route of potential exposure. This section briefly summarizes the potentially exposed populations, the exposure pathways evaluated, and the exposure quantification from the HHRA performed for the B&B Site.

A complete discussion of all the scenarios and exposure pathways is presented in the Baseline HHRA section of the Brown and Bryant RI/FS report, Appendix B, and is summarized in the following discussions and depicted in the B&B Site Conceptual Site Model presented in Figure 5-1.

As depicted in the CSM, the following pathways for current and future receptors were considered complete based on the presence of all four pathways and the nature of the B&B Site, as well as the assumption that pavement, concrete, buildings, and asphalt caps could be removed to expose the underlying soil.

- **Ingestion and direct contact with surface soil** (2 feet or less bgs) for on-site maintenance workers, and shallow and deeper subsurface soils (0 to 2 feet bgs) for the hypothetical future on-site commercial/industrial worker;

- **Inhalation of airborne contaminants in outdoor air** (VOCs and particulate matter from subsurface and surface soils) for off-site residents and commercial/industrial workers, and on-site maintenance workers, and commercial/industrial workers;

- **Inhalation of indoor air contaminants in soil and groundwater** (particulate matter from surface and subsurface soils and VOCs from soils and groundwater) for off-site residents and indoor commercial/industrial workers, and on-site maintenance workers; and

- **Ingestion, dermal contact, and inhalation of groundwater contaminants** for domestic usage (washing, bathing, laundry, etc.) and as a potable drinking water supply for potential off-site residents (i.e., untreated water supply) and on-site commercial/industrial worker.

It should be noted that the assumption that residents could be exposed to contaminated groundwater from the B&B Site is highly conservative. Contamination at the B&B Site has not affected drinking water sources in the City of Arvin area. The perched A-zone groundwater is not a current or a potential source of potable water in the area of the B&B Site. The contamination in the perched aquifer A-zone does pose a potential threat to the underlying unconfined regional aquifer (B-zone) and the confined C-zone aquifer that is used for municipal drinking water. Public and private wells within 3 miles of the site provide drinking water to 7,200 people and irrigate 19,600 acres of cropland. Arvin City Well CW-1 is 1,500 feet down gradient from the site. None of these supply wells are known to produce water from the A-zone or B-zone. Trace levels of COCs have reached City Well No. 1, but are below the existing MCLs. If contamination is allowed to migrate, the Arvin City Well CW-1 could significantly be impacted by contamination.

Further, regulations such as the Safe Drinking Water Act prohibit water suppliers form serving water contaminated in excess of drinking water standards (MCLs) to consumers.

7.1.3 Toxicity Assessment

Tables 7-1 to 7-4 shows the seven COCs that are the major risk contributors for the B&B Site. Based on data from EPA, California/EPA, and other published data, of the seven COCs, Chloroform is reasonably anticipated to be a human carcinogen (The Merck Index, 2001), and the other six are non-carcinogenic but are known to cause short-term and long-term health effects when humans are exposed to these chemicals at concentrations above the MCLs.

In accordance with Cal/EPA's suggested hierarchy of sources used to locate dose-response values, relevant carcinogenic and non-carcinogenic dose-response values were obtained from the following sources (in descending order of preference):

1. California Cancer Potency Factors (CPFs) developed by the California Environmental Protection Agency's (Cal/EPA's) Office of Environmental Health Hazard Assessment (OEHHA);

2. EPA's Integrated Risk Information System (IRIS) database;

3. Current edition of EPA's Health Effects Assessment Summary Tables (HEAST) for fiscal year 1997.

Table 7-1
Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentrations (Soil 0-10 Feet Below Ground Surface)

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Soil

Contaminants of Concern	Number of Samples	Number of Detects	Minimum Concentration Detected (mg/Kg)	Maximum Concentration Detected (mg/Kg)	Exposure Point Concentration (mg/Kg)	Statistical Measure
Chloroform	60	0	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	75	2	1.00E-02	1.00E-02	9.10E-03	95 UCL Lognormal
1,2-Dichloropropane	75	1	8.00E-02	8.00E-02	8.00E-02	Maximum UCL
1,3-Dichloropropane	75	0	ND	ND	ND	ND
Dinoseb	77	3	2.00E-01	2.15E+00	1.05E-01	95 UCL Normal
Ethylene Dibromide	75	1	6.00E-03	6.00E-03	6.00E-03	Maximum UCL
1,2,3-Trichloropropane	75	1	1.00E-01	1.00E-01	1.00E-01	Maximum UCL

Notes:
ND – Not Detected
Exposure Point Concentration – distribution-specific UCL value that does not exceed the detected maximum; when distribution unknown, maximum UCL that does not exceed detected maximum

Table 7-2
Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentrations (Soil 10 Feet Below Ground Surface To Top Of A-zone Groundwater)

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Soil

Contaminants of Concern	Number of Samples	Number of Detects	Minimum Concentration Detected (mg/Kg)	Maximum Concentration Detected (mg/Kg)	Exposure Point Concentration (mg/Kg)	Statistical Measure
Chloroform	356	5	3.00E-03	1.60E-01	1.24E-01	95 UCL Normal
1,2-Dibromo-3-chloropropane	482	27	1.00E-02	6.95E-01	2.09E-02	95 UCL Normal
1,2-Dichloropropane	487	47	1.30E-03	1.52E+01	2.48E-01	95 UCL Normal
1,3-Dichloropropane	479	11	3.00E-02	2.12E+00	1.40E-01	95 UCL Lognormal
Dinoseb	416	8	3.00E-02	5.00E-02	3.60E-02	95 UCL Lognormal
Ethylene Dibromide	480	13	4.00E-03	6.60E-02	7.10E-03	95 UCL Lognormal
1,2,3-Trichloropropane	486	37	1.40E-03	7.10E-01	1.96E-01	95 UCL Lognormal

Notes:
Exposure Point Concentration – distribution-specific UCL value that does not exceed the detected maximum; when distribution unknown, maximum UCL that does not exceed detected maximum

Table 7-3
Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentrations (A-Zone Groundwater)

Scenario Timeframe: Current
Medium: Groundwater
Exposure Medium: Groundwater

Contaminants of Concern	Number of Samples	Number of Detects	Minimum Concentration Detected (mg/L)	Maximum Concentration Detected (mg/L)	Exposure Point Concentration (mg/L)	Statistical Measure
Chloroform	268	123	1.10E-04	1.90E+00	1.98E-01	95 UCL Normal
1,2-Dibromo-3-chloropropane	264	180	6.20E-06	1.70E+01	7.34E-01	95 UCL Normal
1,2-Dichloropropane	278	242	4.00E-04	1.60E+02	2.32E+01	95 UCL Normal
1,3-Dichloropropane	246	98	2.00E-04	1.00E+00	1.37E-01	95 UCL Normal
Dinoseb	231	151	3.00E-04	5.50E+00	NV	NV
Ethylene Dibromide	225	123	1.50E-05	1.56E+00	1.07E-01	95 UCL Normal
1,2,3-Trichloropropane	277	224	1.30E-04	1.10E+01	1.57E+00	95 UCL Normal

Notes:
NV – Not Volatile thus no exposure point concentration was calculated

Table 7-4
Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentrations (Indoor Air)

Scenario Timeframe: Future
Medium: Soil and Groundwater
Exposure Medium: Indoor Air

Contaminants of Concern	Number of Samples	Number of Detects	On-Site Indoor Commercial/Industrial Exposure Point Concentration[1] (mg/m^3)	Off-Site Indoor Residential Exposure Point Concentration[1] (mg/m^3)	Statistical Measure[1]
Chloroform	N/A	N/A	1.67E-04	1.14E-04	N/A
1,2-Dibromo-3-chloropropane	N/A	N/A	1.18E-05	3.71E-05	N/A
1,2-Dichloropropane	N/A	N/A	3.36E-03	5.89E-04	N/A
1,3-Dichloropropane	N/A	N/A	8.57E-05	1.42E-02	N/A
Dinoseb	N/A	N/A	NV	NV	N/A
Ethylene Dibromide	N/A	N/A	1.64E-05	1.43E-07	N/A
1,2,3-Trichloropropane	N/A	N/A	5.96E-05	6.59E-05	N/A

Notes: N/A Not available from actual air sampling or not applicable
[1]*Concentrations were developed from soil and groundwater concentrations using the Johnson and Ettinger Model (USEPA 2000)*

Toxicity profiles have been provided in Appendix E of RI/FS Report. Searches of the OEHHA and IRIS databases were conducted in March 2003. For complete information on toxicity of each chemical, see the RI/FS Report, Appendix I-B-Baseline Human Health Risk Assessment, Final.

7.1.4 Risk Characterization

Risk characterization is the estimate of potential carcinogenic and non-carcinogenic effects of Constituents of Potential Concern (COPCs) over a lifetime of exposure. Risk characterization is the final step in the risk quantification process and incorporates the information from the toxicity assessment and the exposure point concentrations.

This section presents the results of the evaluation of the potential risks to human health associated with exposure to contaminated soil and groundwater at the B&B Site.

Potential health effects to humans following exposure to site-related COCs were estimated using methods established by EPA and Cal/EPA. Key documents used as guidance for preparing this risk assessment are presented in Section 7.0 of the B&B Site RI/FS Report.

Carcinogenic and non-carcinogenic risks resulting from exposure to site-related COCs were calculated for each of the five receptor groups and are expressed as follows:

- Carcinogenic effects: incremental lifetime cancer risk (ILCR)
- Non-carcinogenic effects: hazard index (HI)

The resultant ILCR and HI values are derived from the intake equation and are used to evaluate potential health impacts.

The ILCR is an upper-bound estimate of the incremental cancer probability for individuals who may have been exposed to site-related, potentially carcinogenic COCs. The ILCR is compared to a range of acceptable probabilities to determine whether the potential hazard poses an unacceptable health threat. EPA currently uses an ILCR of 1 in 10,000(10^{-4}) to 1 in 1,000,000 (10^{-6}) as the range of acceptable risks.

The potential health effects resulting from exposure to a non-carcinogenic, hazardous COPC are evaluated by comparing a receptor's exposure or intake level to the reference dose levels (RfD) of that COPC. The ratio of intake over the RfD is termed the hazard quotient (HQ). An RfD is the daily exposure level likely to cause no appreciable risk of deleterious effects during a lifetime. If the HQ is greater than 1 or "above unity," there may be concern for potential non-carcinogenic health effects. The level of concern increases as the HQ increases above unity, although the two are not linearly related. When receptors are exposed to more than one COPC through multiple pathways, it is useful to develop a total HI. The HI is the sum of HQs across pathways. The HI is also compared to a threshold level of unity.

7.1.5 Health Risk For the Site

The HI and ILCR results for each receptor studied are presented in Tables I-7-15 through I-7-18 of the RI/FS Report. The results include consideration of both current and future exposure scenarios. A reasonable maximum exposure (RME) approach was used to quantify potential health impacts (see Brown and Bryant RI/FS Section 4.0 of Appendix I-B). If the RME values are within acceptable limits, then all other lesser exposures related to the B&B Site are also within these limits. A summary of health risk calculation results is presented in the Table 7.5

Table 7-5
Summary of Health Risks for the Brown and Bryant Superfund Site

RECEPTORS	Current Site Conditions		Future Site Conditions	
	Hazard Index (HI)	Incremental Lifetime Cancer Risk (ILCR)	Hazard Index	Incremental Lifetime Cancer Risk
On-Site Maintenance Worker	5.9E-03	1.0E-07	5.9E-03	1.0E-07
On-Site Commercial Industrial Worker	1.2E-01	7.5E-06	1.2E-01	7.5E-06
Off-Site Resident Adult	8.4E-03	4.0E-07	6.7E-01	1.3E-04
Off-Site Resident Child	2.8E-02	2.7E-07	2.3E+00	8.4E-05
Off-Site Commercial/ Industrial Worker	2.0E-03	8.0E-08	1.9E-02	4.0E-06

In addition, a conservative two-tiered health screening analysis was completed in 2007 based on results of the 2006 soil vapor sampling, as requested by California DTSC, for the assessment of potential human health risks associated with the potential migration of soil vapors to indoor air. All of the detected VOCs in the soil vapor samples were below the CHHSLs, confirming that the projected onsite and offsite risk, using the Johnson and Ettinger screening model, for the soil vapor sampling results are significantly below the HI of 1 and 10^{-06} ILCR criteria.

The risk assessment has shown, in a conservative manner, that current site conditions do not pose significant risk to receptors. However, further off-site migration of COCs may result in a significant increase in potential risk associated with indoor air exposures because of the absence of any protective cap off-site. Off-site migration of the plumes in the A-zone beyond their current extent is not likely because of the limited extent of the saturated A-zone, which are the main container and carrier of the COCs. Off-site migration of the plumes in the B-zone aquifer beyond their current extent are not expected to increase risk because of the significant attenuation from the transport that is estimated to occur in this saturated zone as well as the depth of the groundwater in this zone. Based on these conditions, off-site indoor air is not a risk of exposure.

7.1.6 Uncertainty Analysis

The goal of a health risk assessment is to provide scientific and objective risk estimates that enable effective risk management. In this section, the calculated risk values are evaluated to identify the type and degree of uncertainty introduced in the risk assessment process.

Reviewers can be misled if they rely only on a simplified numerical presentation without considering the uncertainties, limitations, and assumptions inherent in the health risk assessment process. For example, an insignificant cancer risk may be calculated for an individual from exposure to a particular source of chemicals. However, if the uncertainty in this number is measured in orders of magnitude, then the real risk from this source may in fact be higher than the risk from another contaminated source that has a higher calculated risk but a small degree of uncertainty. The uncertainties and conservatism inherent in this risk assessment are considered in the evaluation of the risks. For more detailed information about the uncertainties, refer to the B&B Site RI/FS report Section 6 of Appendix I-B.

7.2 Summary of Ecological Risk Assessment

EPA Region 9, Superfund Division conducted a Phase I ecological risk assessment as part of the OU-1

studies. The main ecological concern noted was the surface soils contaminated with elevated concentrations of dinoseb as well as other contaminants. The purpose of the assessment was to review existing site data, and conduct limited fieldwork to evaluate the potential for ecological impacts from contaminants on-site and the need for the nature of any additional ecological assessment activity.

EPA conducted preliminary site surveys in July 1991 with the California Department of Fish and Game (CDFG), and in December 1992 to identify potential habitats and determine species likely to inhabit the area. Analytical results indicate that the toxicity and concentrations of contaminants in soil could have adverse chronic effects on individual and on-site populations of primary and secondary consumers. However, off-site populations were not expected to be significantly impacted because of low potential exposure to contaminants. Exposure of off-site populations to windborne pesticide residues originating from the Site would be insignificant relative to pesticide/herbicide exposure in the surrounding agricultural areas. Based on the existing Site condition, it was determined that there are no substantial risks to wildlife from contaminants, supported by a very low potential exposure of wildlife to contaminants plus removal activities that would reduce potential risks. No further investigations were recommended.

An environmental evaluation of ecological risks was conducted to quantify the potential risks to the environment as part of OU-2 studies in 2003. This analysis consisted of conducting a search of the CDFG California Natural Diversity Database (CNDDB) and performing a site survey to locate any potential ecological receptors and/or sensitive habitats. The findings indicate that there were no potential ecological receptors at or adjacent to the Site. It was determined that they are not expected to occur based on the disturbed nature of the Site, with limited amounts of natural habitats where the identified receptors would be found. Because the identified ecological receptors were not located at or adjacent to the Site, the determination was made that there was no need to conduct an ecological risk assessment.

7.3 Risk Assessment Conclusions

Remedial investigation studies have been performed at the Brown and Bryant facility located in the city of Arvin, California. The focus of the RI was the OU-2 at the B&B Site. The primary objective of the RI was to assess the source and extent of COCs, their fate and transport, and their potential risk to human receptors and the environment at the Site and contiguous adjacent properties. The focus of the OU-2 RI was on the subsurface soil from the bottom of the first water-bearing unit (A-zone groundwater) to the second water-bearing unit (B-zone groundwater) and the B-zone groundwater located at a depth of approximately 150 feet bgs, extending to a depth of approximately 275 feet bgs, where the top of the Corcoran Clay begins.

Several VOCs and SVOCs including 1,2,3-TCP, DBCP, EDB, 1,2-DCP, chloroform, acetone, Bis (2-ethylbexyl) phthalate, 2-methylnaphthalene, and methyl chloride were detected in relatively low concentrations in some of the collected and analyzed samples from the A and/or B unsaturated zones. Herbicides and pesticides, including dinoseb, 4,4-dichlorodiphenyltrichloroethane (4,4-DDT), and 2-(2-Methyl-4-chlorophenoxy) propionic acid (MCPP) were also detected in some of the collected and analyzed soil samples. Up to 13 metals were detected in some of the samples collected during investigations at the site. With the exception of mercury, the reported metal concentrations are within the general naturally occurring range for soil in southern California. B-zone groundwater is contaminated by COCs from percolation of the A-zone COC impacted perched groundwater. The B-zone aquifer is not a current drinking water source, however it is classified as a potential drinking water source. The COC contaminated B-zone groundwater plume has migrated offsite south and southwest of the Site towards the Arvin City water supply well CW-1 completed in the deeper C-zone aquifer. The B-zone aquifer and the C-zone aquifer are hydraulically separated by the Corcoran Clay layer. However, the gravel packed well CW-1 could be a conduit for migration of COC contaminated groundwater to C-zone in the future.

Subsurface groundwater flow and the potential migration paths of the COCs were evaluated using numerical models. The fate and transport modeling results suggest that the COCs in the unsaturated zone persist longer than in the saturated zone. The modeling results showed that transport of the COCs occurs primarily in the vertical direction in the unsaturated zone. In the B-zone groundwater, flow and transport are mainly southwesterly toward the city well. These modeling results also showed that the COCs in the B-zone groundwater might persist for a maximum of 10 years in the absence of vertical leakage from the unsaturated zone. This conclusion is partly supported by the observation that concentrations of COCs have declined in the B-zone groundwater since the installation of the RCRA cap over the site. Installation of the RCRA cap and the non-RCRA cap has reduced the infiltration rate and the percolation from the A-zone over the Site. Based on results of the fate and transport modeling, the concentrations of COCs would have been expected to diminish to significantly lower values. The reason for persistence of the COC plumes in the B-zone groundwater in recent years is suspected to be continued leakage from the A-zone. Although retardation factors for the COCs could also explain the cause of this persistence, the significant differences between the retardation factors of the COCs involved would have resulted in selective persistence of the COCs. That is, concentrations of COCs with smaller retardation factors would have been significantly lower than those observed during recent years.

A risk assessment was developed to estimate the potential for risk to human health from the presence of detected residual chemicals at the Site. Risks have been quantified under both current and future controlled conditions and include the potential health risks to future site users in terms of non-carcinogenic HI and ILCR exposure scenarios.

The risk assessment has shown, in a conservative manner, that current site conditions do not pose significant risk to receptors. However, further off-site migration of COCs may result in a significant increase in potential risk associated with indoor air exposures because of the absence of an engineered cap off-site. Off-site migration of the plumes in the A-zone beyond their current extent is not likely because of the limited extent of the saturated A-zone, which are the main container and carrier of the COCs.

Under the current exposure scenario, the carcinogenic risks for all receptors are within the acceptable standard of 10^{-4} (1 in 10,000) to 10^{-6} (1 in 1,000,000) risk management goal stipulated by EPA. Although, if the cap is disturbed by any on-site construction activities, the 7.5×10^{-6} risk for the onsite commercial industrial worker exceeds the risk level of 1 in 1,000,000 typically applied by the State of California. The projected risks to this receptor are associated with potential indoor air exposures to contaminants originating from the underlying soils and groundwater. However, the 2006 soil vapor sampling results show that the projected risks are well below the 1 in 1,000,000 level typically employed by the State of California for the management of risks under uncontrolled land use conditions.

Under the future reasonable maximum exposure scenario, the 1.3×10^{-04} carcinogenic ILCR for the off-site resident is above the upper end (10^{-4}) of the risk management goal stipulated by EPA. Carcinogenic ILCR for the on-site and off-site Commercial/Industrial Worker and off-site Resident Child under the future reasonable maximum exposure scenario exceeds the risk level of 1 in 1,000,000 typically applied by the State of California.

7.4 Basis for Action

Action is warranted at the B&B Site because the COC concentrations in the B-zone aquifer, a potential drinking water source as classified by the State of California, are significantly above the drinking water MCLs. Since the B-zone groundwater is classified as a potential source of drinking water supply, it is a point of compliance for the B&B Site OU-2. COCs in the A-zone are the source of the continued contamination of the B-zone aquifer. Extraction and treatment of A-zone groundwater, a component of the

selected OU-1 remedy, is a carry over task for the OU-2 remedy to protect B-zone groundwater. In addition, the Arvin City well CW-1 in the C-zone aquifer, a current source of municipal water supply is at risk of being affected by the COCs in the A-zone and B-zone groundwater at the B&B Site.

Actual or threatened release of hazardous substances from the B&B Site, if not addressed by implementing the response selected in this ROD, may present a current or potential threat to public health, welfare, or the environment.

8.0 Remedial Action Objectives

The remedial action objective for the B&B Site OU-2 is to protect human health and the environment from conditions in the subsurface that have been identified in the RI. For OU-2, there are two primary pathways: (1) exposure to groundwater within the B-zone; and (2) exposure to groundwater from the C-zone. The A-zone groundwater at the Site is impacted by COCs. However, direct exposure to the A-zone groundwater is not a primary pathway as it is not a current or a potential source of potable water supply. The COC impacted A-zone groundwater is the source of contamination for the B-zone groundwater. Migration of the impacted A-zone groundwater has resulted in B-zone groundwater contamination above MCLs, and continues to further degrade the B-zone groundwater. The B-zone groundwater is not a known current exposure route as no drinking water supply wells with screens or intake intervals within the B-zone have been identified from well inventories and site investigations. However, it is classified by the CVRWQCB as a potential drinking water source because of sufficient water yield. The C-zone groundwater is a drinking water source, and the Arvin City water supply Well CW-1 is closest to the B&B Site. The sampling results indicate that the COCs from the Site are not known to have contaminated this well above established MCLs. However, low levels COCs are sometimes reported to be present in the sampled water from the Arvin City Well CW-1. COC impacted B-zone groundwater is not expected to migrate vertically down to the C-zone aquifer as the Corcoran Clay Layer hydraulically separates them. However, impacted water could migrate from the A-zone and B-zone into C-zone through annular space of any C-zone well with a poor annular seal. The Arvin City Well No.1 (CW-1) could be a conduit for transporting contamination from the B-zone to the C-zone.

Since the B-zone groundwater is classified as a potential source of drinking water supply, it is a point of compliance for the B&B Site OU-2. The Arvin City Well CW- 1 does not use the B-zone groundwater as a source and is not screened in that zone. However, it is the closest public supply well and does penetrate through the B-zone to access the deeper C-zone aquifer.

The specific remedial action objective for the B&B Site OU-2 is to:

- remove or control COCs in the A-zone groundwater such that it is no longer a source of contamination to B-zone and C-zone groundwater,
- restore the B-zone groundwater to its potential beneficial use as drinking water aquifer, and
- prevent potential exposure to contaminated groundwater.

Source reduction by lowering COC concentrations in the A-zone groundwater will cease further contamination of B-zone groundwater. Remediation within the B-zone will address the potential exposure pathway of ingestion of groundwater from this zone. Institutional controls would prevent migration and potential exposure to contaminated groundwater.

9.0 Description of Alternatives

Seven alternatives were developed for both subsurface soil and groundwater and evaluated against EPA criteria in the RI/FS Report. One of the alternatives considers two technologies bringing the total number of alternatives to seven. Extraction and treatment of A-zone groundwater, a component of the selected OU-1 remedy which was a carried over task into the OU-2, is included in the alternatives. Additionally, the relocation of the Arvin City Well CW-1 to prevent potential exposure to contaminated groundwater is a part of all alternatives, except the No Action.

- **Alternative 1:** No Action,
- **Alternative 2:** Monitored natural attenuation,
- **Alternative 3:** Source reduction in the A-zone and no action in the B-zone,
- **Alternative 4a:** Dual-phase extraction and treatment of vapor and groundwater in the A-zone and no action in the B-zone,
- **Alternative 4b:** In-situ bio-treatment and bio-augmentation in the A-zone and no action in the B-zone,
- **Alternative 5:** No action in the A-zone and groundwater extraction and treatment in the B-zone, and,
- **Alternative 6:** Groundwater extraction and treatment in the A-zone and the B-zone.

Alternatives 4a and 6 require the construction of wells that for effective coverage at the Site may require disturbance and penetration through the RCRA and non-RCRA caps. Whereas it is recognized that these may not be viable options for this reason, these alternatives are retained for evaluation, as it may be possible that engineering approaches can be found during detailed design that allow for the implementation of the remedy without disturbance of the cap. One such approach may be use of directional or horizontal drilling techniques that reach the remediation zone from outside of the cap areas.

9.1 Description of the Alternatives/Remedy Components

9.1.1 Alternative 1: No Action

In this alternative there is no planned remedial action in the B-zone (OU-2) and the site remains in its present condition. The in-situ conditions will be monitored periodically to evaluate the groundwater concentrations of the COCs. This alternative is a baseline condition against which other alternatives can be compared. The consideration of this alternative is required by federal regulation.

9.1.2 Alternative 2: Monitored Natural Attenuation

This alternative is to monitor the site conditions, specifically natural attenuation of the COCs in the B-zone groundwater. The natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization and chemical or biological stabilization, transformation, or destruction of contaminants. The fate and

transport model for the Site indicates that relatively fast flow and transport in B-zone aquifer would naturally attenuate COC concentrations in the B-zone such that COCs would be below the drinking water MCL within a reasonable timeframe, if the source, COCs in the A-zone groundwater is reduced and controlled. The periodic groundwater monitoring required for monitored natural attenuation is a continuation of the on going monitoring that has been part of site work since 1987. The monitoring would observe the combined effects of A-zone groundwater remediation and the natural attenuation processes resulting from relatively fast B-zone aquifer flow in mitigating the COC concentrations in the groundwater (Fate and Transport Modeling Report, Appendix I-A of the RI/FS Report).

This alternative would also include additional institutional controls to address potential health risks and maintain the effectiveness of the remedy. These controls may include deed and zoning restrictions (short-term or long-term) and/or permit requirements in order to restrict well drilling and groundwater pumping within at least half a mile from the facility to prevent access to impacted groundwater and to ensure that pumping influences do not spread contamination, reducing the effectiveness of the remedy.

If one of Alternatives 3 through 6 is selected, it is expected that some or all of the features of Alternative 2 would be incorporated into the selected alternative.

9.1.3 Alternative 3: Source Reduction In The A-Zone, No Action In The B-Zone

This alternative consists of dewatering in the A-zone to reduce, immobilize and control the source of contaminants to the B-zone groundwater. The A-zone will be dewatered by extraction and treatment. The treated groundwater is then discharged to the Arvin City sewer. For this alternative, up to 4 large diameter sump wells are installed at selected locations off-site and south of the site to intercept the A-zone contaminated water. Using this approach there is no disturbance to the on-site RCRA/non-RCRA caps.

The large diameter sump wells will be constructed by drilling the 8-foot diameter holes at select locations to a depth of 75 feet or into the clay layer that separates the A-zone and B-zone. Because this clay layer is relatively thin, field procedures will be required to ensure that penetration into the clay is minimal to avoid breaching it, but sufficient to allow the well to serve as a sump for A-zone water. It is expected that about 1-foot penetration into the clay layer will allow these objectives to be met. The drill hole will be encased with a CMP Pipe and the lower 25 feet will be filled with gravel. A 12-inch poly-vinyl-chloride pipe that is open-screened in the gravel-filled zone will be installed to the base of the well for extraction of the collected water in the well.

It is expected that an average of 15 to 150 gallons per day of water may be extracted from the A-zone using this approach. At peak this may approach or slightly exceed 1,000 gallons per day. There appear to be two options available to manage this extracted contaminated water: 1) temporarily store the water at the site and periodically transport off-site for treatment and disposal; and 2) use an UV/Oxidation treatment system installed at the non-RCRA cap portion of the site for treatment and discharge of the treated water to the Arvin City sewer. A cost-benefit assessment will be performed at the time the remedy is implemented to assess which of these options is better.

In the design of the water pumping system, it will be required that the scheme allows for periods of time when the wells are dry. After several years of operation, it may be that pumping of the A-zone water occurs only on a seasonal and periodic basis. Because of the presence of the A-zone RCRA and non-RCRA caps, the replenishment of the A-zone from infiltration from the B&B Site areas will be limited allowing for little flushing of the soil contamination that remains. As the remediation progresses, site observations will allow better evaluation of the availability of water in the A-zone and the impacts of its dewatering. To the extent that methods are available to improve the process by increased "flushing" of the contaminants, these may

be considered as system enhancements at a later stage.

Periodic monitoring of the A-zone and B-zone groundwater is needed to assess the changing site conditions and the impact of the installed remediation system. It is expected that this monitoring will extend until the OU-2 goal of achieving the B-zone groundwater to COC MCL levels have been met, and there is no further threat to the B-zone groundwater from the A-zone contamination. The remedial action cleanup level goals for A-zone groundwater (10 times the contaminant MCLs) may be used as a guide for evaluating the progress of the remedial action. It is estimated that it will take ten years to dewater the A-zone so that it is no longer a source of contamination to the B-zone groundwater.

9.1.4 Alternative 4a: Dual-Phase Extraction And Treatment Of Vapor And Groundwater In The A-Zone And No Action In The B-Zone

This alternative is another option to the general remedial approach of Alternative 4. In this alternative a total of 80 wells will be installed to serve as extraction and service wells in the A-zone vadose and saturated zones. Details of technology utilized will be dependent on whether a site-specific design is utilized to extract water and vapor under vacuum or one of the proprietary and licensed technologies is purchased for site implementation.

For effective utilization of this alternative, many of the wells will need to be installed on-site requiring penetration through the RCRA and non-RCRA cap. This will require a variance from the OU- 1 remedy for implementation of this alternative. This may not be possible and for this alternative to be viable, an alternative method to vertical drilling would then be required. Directional drilling of the extraction wells would be considered as an alternative method.

Water and vapor will be extracted in one stream to the treatment system where the phases will be separated for treatment. It is expected that the vapor phase will be treated using activated carbon and the liquid phase will be treated by UV/Oxidation. The treated groundwater will then be discharged to the Arvin City sewer. At peak, the extracted liquid may approach or exceed 1,000 gallons per day. There are two options available to manage this extracted contaminated water: 1) temporarily store the water at the site and periodically transport off-site for treatment and disposal; and 2) use an UV/Oxidation treatment system installed at the non-RCRA cap portion of the site for treatment and discharge of the treated water to the Arvin City sewer. A cost-benefit assessment will be performed during the remedy design to select and design the preferred option for management of extracted groundwater during remedy implementation.

Field pilot testing would be necessary to verify the effectiveness of multi-phase extraction and to provide information for design. The data requirements include the soil vapor concentrations of site contaminants in the unsaturated A-zone as an indication of the distribution of vapor-phase and residual contamination. The pilot testing would verify the ability of the applied vacuum to remove mass from the vadose zone, enhance groundwater recovery, and dewater soils. The test would further determine air and water flow rates and extracted vapor concentrations for design of treatment systems. The air permeability and large scale hydraulic conductivity distribution would need to be determined for choice of well spacing.

Periodic monitoring of the A-zone and B-zone groundwater is needed to assess the changing site conditions and the impact of the installed remediation system. It is expected that this monitoring will extend until the OU-2 goal of achieving the B-zone groundwater to COC MCL levels have been met, and there is no further threat to the B-zone from A-zone contamination. The remedial action objective for A-zone groundwater (10 times the contaminant MCLs) may be used as a guide for evaluating the progress of the remedial action. It is estimated that it will take longer than ten years to remediate the A-zone groundwater.

9.1.5 Alternative 4b: In-Situ Bio-Treatment And Bio-Augmentation In The A-Zone And No Action In The B-Zone

In this alternative, a total of 15 wells are planned for obtaining access to the treatment zones within the A-zone. It is expected that different treatment processes will be required in various site areas dependent on the nature of contamination assessed in the treatment zones. In zones where the chlorinated propanes are the driving risk, cometabolic/aerobic treatment processes will be planned. However, in zones where dinoseb is the driving risk, anaerobic treatment processes will be planned. An alternative scheme would treat the zones sequentially by implementing a cometabolic/aerobic treatment process at the start and then after treatment of the chlorinated propane has been achieved, transition into anaerobic treatment for dinoseb.

For effective utilization of this alternative, some of the wells installed on-site may require penetration through the RCRA cap. This is currently not allowable, as it would violate the implemented OU- 1 remedy. For implementation of this alternative, another method to vertical drilling in the area of the RCRA-cap will be required. An alternative approach to obtain access to the treatment zone under the caps is the use of directional drilling of wells.

Additional field data are needed for effective implementation of this alternative. In addition to site-specific geochemical and hydrogeologic information, it is expected that bench-scale laboratory tests would be required for preparing the design. Also, when implementing this alternative it may be appropriate to identify field plots for pilot testing to evaluate the design assumption for the effectiveness of the remedial scheme.

Periodic monitoring of the A-zone and B-zone groundwater is needed to assess the changing site conditions and the impact of the installed remediation system. It is expected that this monitoring will extend till the OU-2 goal of limiting the B-zone groundwater to COC MCL levels is achieved and there is no further threat to the B-zone from A-zone contamination. The remedial action objective for A-zone groundwater (10 times the contaminant MCLs) may be used as a guide for evaluating the progress of the remedial action. It is estimated that it will take longer than ten years to remediate the A-zone groundwater.

9.1.6 Alternatives 5: No Action In The A-Zone And Groundwater Extraction And Treatment In The B-Zone

In this alternative it is proposed to install a total of 75 wells to the B-zone in a conventional pump and treat approach to remediate the B-zone groundwater. It is expected that this can be accomplished by wells situated off-site as penetration of the on-site caps and the A-zone confining clay layer would not be recommended.

Accordingly, this alternative would retain the OU-1 remedies and controls. It would not require any disturbance to the on-site caps. The pumped water will be transported to the UV/Oxidation treatment system that may be located in the non-RCRA cap portion of the site or at a convenient off-site location. The treated groundwater will be discharged to the Arvin City sewer.

Periodic monitoring of the A-zone and B-zone groundwater is needed to assess the changing site conditions and the impact of the installed remediation system. It is expected that this monitoring will extend until the OU-2 goal of achieving the B-zone groundwater to COC MCL levels have been met, and there is no further threat to the B-zone from A-zone contamination. It is estimated that it will take longer than ten years to attain MCLs in the B-zone groundwater with no source reduction in the A-zone.

9.1.7 Alternative 6: Groundwater Extraction And Treatment In The A-Zone And B-Zone

This alternative is combined Alternative 4a and 5 approaches where remediation is planned and implemented in both the A-zone and the B-zone. All of the factors that are described for these alternatives above would be applicable in this alternative. Since both A-zone and B-zone treatment is planned, it may be possible to realize effective efficiencies by combining some of the installed wells to extract from both A- and B-zones. Periodic monitoring of the A-zone and B-zone groundwater is needed to assess the changing site conditions and the impact of the installed remediation system. It is expected that this monitoring will extend until the OU-2 goal of limiting the B-zone groundwater to COC MCL levels is achieved and there is no further threat to the B-zone from A-zone contamination. The remedial action objective for A-zone groundwater (10 times the contaminant MCLs) may be used as a guide for evaluating the progress of the remedial action within that zone. It is estimated that it will take longer than ten years to remediate the A-zone and the B-zone groundwater.

9.2 Common Elements And Distinguishing Features Of Each Alternative

Common elements to Alternative 3, Alternative 4a, Alternative 4b, Alternative 5 and Alternative 6 include:

- Source reduction in either the A-zone or B-zone.
- Reduced mobility of the COCs in the groundwater in either the A-zone or B-zone.
- Attainment of ARARs.

The distinguishing elements include:

- Alternative 3, Alternative 4a, Alternative *5,* and Alternative 6 use ex-situ physical treatment for either the A-zone or the B-zone.
- Alternative 4 uses in-situ and ex-situ treatment in the A-zone.

10.0 Comparative Analysis of Alternatives

The alternative remediation technologies identified were evaluated in detail with respect to nine evaluation criteria developed by EPA to address the statutory requirements and preferences of CERCLA. These nine criteria are as follows:

1. Overall protection of human health and the environment,
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs),
3. Long-term effectiveness and permanence,
4. Reduction of toxicity, mobility, or volume,
5. Short-term effectiveness,
6. Implement ability,
7. Cost,
8. State acceptance, and
9. Community acceptance.

The alternatives were analyzed individually against each criterion and then compared against each other to determine their respective strengths and weaknesses and to identify the key trade-offs that must be balanced for the site. Results of the detailed analyses have been summarized so that an appropriate remedy consistent with CERCLA can be selected. Technologies included in the evaluation are in-situ and ex-situ groundwater remediation, and mixed remediation methods that incorporate features of more than one technology.

10.1 Overall Protection of Human Health and the Environment

The overall protection of human health and the environment criterion assesses each alternative to determine its effectiveness in reducing risks at the Site. With the surface capped and fenced, there is no risk to on-site workers or trespassers as long as the cap remains intact and its integrity is not compromised. Alternatives 1 and 2 offer no additional protection to groundwater other than natural biodegradation and attenuation. All other alternatives contain a technology to remove COCs from either the vadose zone soil or the groundwater, or both. Table 10-1 provides an evaluation of the seven alternatives relating to the protection of human health and the environment.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternatives 1 and 2 will not comply with substantive requirements of the ARARs because without an active response, contamination from the A-zone is likely to continue and impact the B-zone for an indefinite period of time. The other alternatives are likely to comply with all of the ARARs because contamination migration from A-zone to B-zone will be discontinued or reduced significantly. Table 10-2 presents a discussion of ARARs and their applicability to the alternatives.

10.3 Long-Term Effectiveness and Permanence

Alternatives were assessed for long-term effectiveness and permanence, along with the degree of certainty of success. The alternative that removes the most contamination will be the most permanent. Table 10-3 provides a comparison of the seven alternatives for long-term effectiveness and permanence.

Alternative 4a, which removes contaminants from the A-zone soil and groundwater, affords good long-term effectiveness for the treatment of volatile organics. It is less effective on pesticides (dinoseb). Because this alternative is likely to be most effective in the treatment of the soil, and therefore reduce the source for additional A-zone and B-zone groundwater contamination, its effectiveness is relatively large. Alternative 4b provides for in-situ treatment of soil and groundwater and may have similar effectiveness, as biotreatment is successful in reducing the contaminant concentrations. Other alternatives remove contaminants from only the groundwater and have some degree of uncertainty as to permanence because residual contaminants in the soil could eventually migrate into the A-zone or B-zone groundwater. The long-term effectiveness of these alternatives, which leave contaminated soil in place, will depend upon the maintenance of the cap or will be a function of the effectiveness of the seasonal flushing and natural attenuation to reduce the vadose zone soil contamination,

10.4 Reduction Of Toxicity, Mobility, Or Volume

The alternatives are assessed to the degree that they reduce toxicity, mobility or volume, especially with respect to the principal threat at the site, which is possible contamination of the B-zone groundwater from COCs in the soil above the A-zone groundwater and from COCs in the A-zone groundwater. Previous work has reduced mobility by the installation of caps over all of the property that is not occupied by buildings. A comparison of the reduction in mobility and volume through treatment is provided in Table 10-4. All alternatives, except Alternatives 1 and 2 (no action and monitored natural attenuation), provide for treatments that actively address subsurface contaminants. In Alternatives 4a and 4b the soil contamination is reduced and therefore the mobility of the contaminants is mitigated. Where groundwater treatment is implemented by removing the water for ex-situ treatment, the volume of the contamination is reduced by treatment and the mobility of the contaminants is mitigated.

Table 10-1
Detailed Comparison Of Overall Protection Of
Human Health And Environment

Alternative Description	Comparison
1. No Action	• No reduction in risk of further degrading B-zone groundwater. • No relocation of City Well CW-1.
2. Monitored natural attenuation	• Risk exists of further degrading B-zone groundwater until natural attenuation effectively removes contaminants. Continued source in the A-zone may make natural attenuation ineffective.
3. Source reduction in the A-zone and no action in the B-zone	• Reducing and immobilizing contaminants in the A-zone groundwater reduce risk to B-zone groundwater. • Natural attenuation in the A-zone and the B-zone will further reduce contaminant levels. • Extracted groundwater needs to be treated.
4a. Dual-phase extraction and treatment of vapor and groundwater in the A-zone and no action in the B-zone	• Risk to B-zone groundwater is reduced by removing contaminants from the vadose zone and extraction of A-zone groundwater. • Natural attenuation in the A-zone and the B-zone will further reduce contaminants levels. Biodegradation may be enhanced by the process. • Extracted vapor and water will require treatment. Air emissions from the treatment unit will have to be managed and monitored.
4b. In-situ bio-treatment and Bio-augmentation in the A-zone and no action in the B-zone	• Risk to B-zone groundwater is reduced by removing contaminants from the A-zone vadose zone and groundwater. • Natural attenuation in the A-zone will be enhanced and stimulated to accelerate the degradation of the soil contaminants. • All of the effort is accomplished in-situ and no surface treatment is necessary.
5. No action in the A-zone and groundwater extraction and treatment in the B-zone	• B-zone groundwater is impacted by "leakage" from the A-zone except to the extent that natural attenuation reduces A-zone contamination. • Larger quantity of water is extracted requiring treatment and disposal or discharge to the City sewer.
6. Groundwater extraction and treatment in the A-zone and the B-zone	• Removing contaminants from the A-zone groundwater reduces risk to B-zone groundwater. • Air emissions from the treatment unit will have to be controlled. • Generated waste sludges will have to be contained and proper disposal ensured.

Table 10-2
Compliance With Applicable Or Relevant And Appropriate Requirements (ARARs)

ARAR	Discussion
40CFR141 National Primary Drinking water Standards and *CCR, Title 22,* California Safe Drinking Water Standards (Chemical Specific)	Alternatives 1 and 2 will not comply with the chemical specific ARARs because without an active response, contamination from the A-zone is likely to continue and impact the B-zone for an indefinite period of time. Alternative 3 to 6 are more likely to comply with the chemical specific ARARs because contamination migration from A-zone to B-zone will be discontinued or reduced significantly.
Fish & Game Code §3503 Prohibition- Destruction of Bird Eggs and Nests, and *14 CCR §472* Non-Game Animals Fish & Game regulations (Location Specific)	No location specific ARARs applies to Alternative 1 and 2. For Alternatives 3 to 6, project construction of the selected remedy will comply with this requirement.
State Resolution 68-18, Anti-Degradation (Action Specific)	The fate and transport model has predicted that B-zone groundwater will not be degraded. Alternatives 3, 4, 5, and 6 will treat COCs in the groundwater to their respective MCLs (or below) before disposal into the Arvin City Sewer.
CCR Section 66268, Subpart C, Closure and Monitoring (Action Specific)	This Site has been covered with a combination RCRA cap, non-RCRA cap, and monitoring wells are in place. If any alternative requires drilling a new well through the cap, the cap shall be sealed when the well is completed, restoring the cap.
CCR Section 66268, Subpart C, Land Disposal Restrictions (Action Specific)	Since none of the alternatives involve soil excavation, ex-situ treatment of soil, or removal of contaminated soil to an off-site location, this ARAR is not appropriate for the proposed remediation technologies.
CCR Section 66265, Article 9, Containers (Action Specific)	Containers used in the various remediation technologies shall be designed to comply with the requirements of Article 9.
CCR Section 66265, Article 10, Tanks (Action Specific)	Tanks used for temporary storage of raw groundwater, treated groundwater and/or hazardous waste required for the various remediation technologies shall comply with the specifications for tanks as stated in Article 10.
SDWA – Underground Injection (Action Specific)	Re-injection wells would be classified as Class V.

Notes: CFR = Code of federal Regulations
CCR = California Code of Regulations
MCLs = maximum contaminant levels
SDWA = Safe Drinking Water Act

Table 10-3
Detailed Comparison Of Long-Term Effectiveness And Permanence

Alternative Description	Comparison
1. No Action	• No change from existing conditions and no active action involved.
2. Monitored natural attenuation	• Vertical contaminant transport is mitigated by presence of surface caps. • Natural attenuation effectively removes contamination over a reasonable timeframe. No long-term effectiveness or permanence in alternative other than the natural attenuation processes.
3. Source reduction in the A-zone and no action in the B-zone	• Vertical transport of contaminants will be reduced and to some extent controlled. • Natural attenuation processes will aid in the reduction of groundwater and soil contamination. • Integrity of the caps in important to long-term maintenance.
4a. Dual-phase extraction and treatment of vapor and groundwater in the A-zone and no action in the B-zone	• Vertical contaminant transport is mitigated by presence of surface caps. Integrity of the caps is important to long-term effectiveness • Contaminants in the A-zone removed are destroyed in ex-situ treatment and B-zone contaminant concentrations are reduced by natural attenuation process • Contaminants with low vapor pressure are reduced by removal in the water extracted. Long-term effectiveness of removal of these compounds is dependent on the success of the soil vapor and groundwater extraction. • Heterogeneity of soil layers and the fine-grained materials in the A-zone reduce the effectiveness of the process.
4b. In-situ bio-treatment and Bio-augmentation in the A-zone and no action in the B-zone	• Downward contaminant transport is mitigated by presence of surface caps. Integrity of the caps is important to long-term effectiveness. • Contaminants in the A-zone are treated in-situ by augmented processes that degrade the chemicals. B-zone contaminant concentrations are reduced by natural attenuation processes that may also be aided by the in-situ processes. • Long-term effectiveness is a function of the rate processes that can be achieved with the implemented processes. Chlorinated contaminants and pesticides are harder to break down. • Effectiveness in lower concentration areas of contamination may be higher and the in-situ process may also act to contain the spreading of the plume.
5. No action in the A-zone and groundwater extraction and treatment in the B-zone	• A-zone contamination is a source for B-zone contamination, thereby constraining long-term effectiveness. Completion of the remedial action is dependent on the reduction of A-zone contaminants to levels where their impact on B-zone water is insignificant. • Water from the B-zone with low concentrations of COCs is extracted for ex-situ treatment and disposal or discharge to the Arvin City sewer. • Maintenance and the integrity of the caps is required and serves to slow the completion of the remedial action.
6. Groundwater extraction and treatment in the A-zone and the B-zone	• Impacted groundwater is extracted for ex-situ treatment and disposal or discharge to the Arvin City sewer. Extraction from the A-zone and B-zone increases long-term effectiveness. • Maintenance and integrity of the cap is required.

Table 10-4
Detailed Comparisons Of Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative Description	Comparison
1. No Action	• No active action involved and reduction would occur by natural in-situ processes.
2. Monitored natural attenuation	• Natural attenuation would reduce some volume of contamination. However, no active reduction of toxicity, mobility, or volume of contamination. • Integrity of the caps and their maintenance reduce contaminant mobility and slowdown the impact to the B-zone groundwater.
3. Source reduction in the A-zone and no action in the B-zone	• Dewatering the A-zone actively reduces the toxicity, mobility, and volume of the contamination that is a principal source of contamination for the B-zone. • Integrity of the caps and their maintenance reduce contaminant mobility and slowdown the impact to the B-zone groundwater.
4a. Dual-phase extraction and treatment of vapor and groundwater in the A-zone and no action in the B-zone	• Extraction and treatment of the A-zone soil vapors and groundwater actively reduce the toxicity, mobility, and volume of the contamination that is a principal source of contamination for the B-zone. • Integrity of the caps and their maintenance reduce contaminant mobility and slowdown the impact to the B-zone groundwater.
4b. In-situ bio-treatment and Bio-augmentation in the A-zone and no action in the B-zone	• In-situ treatment of the A-zone soil and groundwater actively reduces the toxicity, mobility, and volume of the contamination that is a principal source of contamination for the B-zone. Toxicity and mobility of the breakdown processes may differ from those of the contaminants and require that these be managed. • Integrity of the caps and their maintenance reduce contaminant mobility and slowdown the impact to the B-zone groundwater.
5. No action in the A-zone and groundwater extraction and treatment in the B-zone	• The remedial action counts on the contamination transporting to the B-zone, where it is removed for ex-situ treatment and disposal or discharge to the city sewer. The toxicity, mobility, and volume of the contamination is actively removed or reduced. • Integrity of the caps reduces contaminant mobility and may not aid in the completion of this remedial action.
6. Groundwater extraction and treatment in the A-zone and the B-zone	• Extraction of the A-zone and B-zone groundwater actively reduces the mobility, toxicity, and volume of the contaminants. • Integrity of the caps reduces contaminant mobility and is less important to the completion of this remedial action.

10.5 Short-Term Effectiveness

The short-term effectiveness criterion assesses for each alternative the short-term risks to workers and the community during implementation of the alternative, potential short-term environmental impacts of the alternative and the time until protection from any short-term risk is achieved. Table 10-5 provides a comparison of the short-term effectiveness of the alternatives.

Since the Site is capped over all areas not occupied by structures, all alternatives that implement active treatments will have varying degrees of short-term effectiveness. There is no imminent threat to human health because of the contamination and so one alternative does not necessarily provide an advantage over the other in its short-term effectiveness.

There is no short-term risk to either workers or the community due to fugitive dust. However, where groundwater is extracted for ex-situ treatment, there may be minimal levels of air emissions containing COCs. Remediation systems that include a vapor treatment unit (Alternative 4a) will require designed control of such emissions. These will be in place before any remediation system is started and should eliminate any short-term risk of exposure to both the workers and the community. In other alternatives, the treatment contemplated is chemical oxidation, where the COCs are destroyed in the treatment. If residual COCs are captured as free liquids or adsorbed in some media, such as activated carbon, as part of the treatment, these will have to be removed from the Site. Transportation of this hazardous waste may pose a short-term risk to communities along the route.

Table 10-5
Detailed Comparisons of Short-Term Effectiveness

Alternative Description	Comparison
1. No Action	• No active action in alternative and no short-term effectiveness.
2. Monitored natural attenuation	• No active reduction in the A-zone soil or groundwater contamination; short-term effectiveness of this action is minimal.
3. Source reduction in the A-zone and no action in the B-zone	• Active dewatering of A-zone groundwater reduces source of contaminants to the B-zone. • Immediate removal of some A-zone contaminants. • Short-term effectiveness is limited and indirect.
4a. Dual-phase extraction and treatment of vapor and groundwater in the A-zone and no action in the B-zone	• Active extraction of A-zone soil vapor and groundwater reduces source of contaminants to the B-zone. • Short-term effectiveness is directly related to the effectiveness of the process in the heterogeneous soil profile of the A-zone. • Highest short-term effectiveness to reduce contaminant concentrations in the vadose zone of the A-zone.
4b. In-situ bio-treatment and Bio-augmentation in the A-zone and no action in the B-zone	• Active degrading of A-zone soil and groundwater contaminants. • Processes are generally slow and there may be limited short-term effectiveness. • Degradation products require management, further impacting short-term effectiveness.
5. No action in the A-zone and groundwater extraction and treatment in the B-zone	• Extraction of water from the B-zone serves to actively remove contaminants from that zone. • Contaminant concentrations in the B-zone are a fraction of those in the A-zone and there is continuing impact on the B-zone from the A-zone sources. • Short-term effectiveness is limited to marginal improvements in the B-zone groundwater conditions.
6. Groundwater extraction and treatment in the A-zone and the B-zone	• Active water extraction from both the A-zone and B-zone provide for targeted reduction in contaminant concentrations in all known impacted areas. • Highest short-term effectiveness • Limited impact in the soil vadose zone, which retains some contamination.

10.6 Implementability

The ease or difficulty of implementing the alternatives is assessed with respect to technical feasibility, administrative feasibility, and availability of services. All alternatives that address either soil remediation, groundwater remediation, or both, use standard, proven technologies. All of these technologies are implementable. The ease of implementability for the different alternatives is evaluated in Table 10-6.

The technical feasibility of dual-phase soil vapor extraction (Alternative 4a and Alternative 6) is dependent upon the ability to conduct air through the silty-sand and silt layers in the soil profile. Also, the effectiveness of this alternative to remove dinoseb is dependent on the quantity of water that can be removed with the process. EPA's past aquifer tests in the A-zone has shown a low yield of water and restricted yield in the B-zone, which would be a challenge for Alternative 4a, 5 and 6. Further site-specific information would be required during design to implement this alternative.

The technical feasibility of bio-treatment and bio-augmentation (Alternative 4b) also depends on additional information that is site specific. Pilot testing in the form of small-scale test implementation may be helpful in developing the design and implementation of the scheme. Because of the diverse nature of the COCs (pesticides and VOCs), a single method may not be effective in remediating all COCs. Combined techniques such as adding diverse nutrients and bio-media are not known to have been successfully implemented. For example, dinoseb may be effectively degraded by in-situ anaerobic bioremediation technology; however, an anaerobic by-product of degradation of some of the VOCs may be vinyl chloride, which has a lower toxicity threshold than the parent COC. VOCs are more effectively degraded by aerobic bioremediation techniques than dinoseb.

All alternatives that implement groundwater extraction and treatment rely on the previous work done by EPA where treatment by chemical oxidation - UV was proven to effectively destroy all of the known COCs at the site. This is an ex-situ process that is implementable and, based on previous testing, is known to be effective in treating the contaminated groundwater. Off-site disposal of hazardous wastes generated during the soil and for groundwater remediation will require permits and approvals from other regulatory agencies.

10.7 Cost

Cost estimates for the seven alternatives are summarized in Table 10-7. The capital costs, operations and maintenance costs, and periodic costs for these alternatives are described in detail in the RI/FS Report in Tables II-3-8, II-3-9, and II-3-10, respectively. These estimates do not include the cost for moving or replacing the Arvin City Well CW- 1, since it is a part of all alternatives and is separately identified as a line item on Table 10-7.

The cost data is based on the most likely estimate of costs for the different alternatives. As appropriate, the technology descriptions found in "The Environmental Restoration and BRAC Remediation Technologies Web Page" was used in the development of these costs. Cost estimates include implementation of remedy, periodic monitoring, and assessment for effectiveness. These costs do not include ancillary costs such as permits and hazardous waste transportation and disposal. Also, ancillary costs of oversight and interaction with third parties has not been included in the estimates. The site area, volume of soil requiring remediation, volume of groundwater requiring remediation, and estimated cycle volume required for remediation to the MCLs are taken from the May 1993 RI/FS Report for OU-1, specifically as these relate to A-zone contamination that is reviewed in this document under source reduction for the B-zone. If one of Alternatives 3 through 6 is selected, it is expected that some or all of the features of Alternative 2 would be incorporated into the selected alternative. Therefore, the cost estimate for Alternative 2 is included in the cost estimate for Alternatives 3 through 6.

Table 10-6
Detailed Comparison Of Implementability

Alternative Description	Comparison
1. No Action	• No active action involved.
2. Monitored natural attenuation	• No active remedial action is necessary, and the in-situ conditions require monitoring as with all other alternatives. This action is implementable.
3. Source reduction in the A-zone and no action in the B-zone	• This action requires extraction of practical quantities of contaminated water for the A-zone. The removed water is to be treated and properly disposed of or discharged to the Arvin City sewer. • This action is implementable. No permits are known to be required for installation and operations.
4a. Dual-phase extraction and treatment of vapor and groundwater in the A-zone and no action in the B-zone	• This action requires extraction of soil vapor and groundwater from the A-zone. • Further field testing may be necessary for the completion of the design of the system and specific form of extraction. • Some technologies, if proven effective, may require licensing. • Low aquifer yield of water present technical difficulties. • This action could be implementable based on the above testing results. No permits are known to be required for installation and operations.
4b. In-situ bio-treatment and Bio-augmentation in the A-zone and no action in the B-zone	• This in-situ form of treatment requires the stimulation of in-situ mechanism or the introduction of appropriate mechanisms to treat the soil and groundwater. • Additional field testing is likely necessary to design the treatment systems and to identify their efficiencies. • This alternative would be technically difficult to design. • This action could be implementable with no permits known to be necessary. RCRA cap disturbance may be avoided by directional drilling of well to reach treatment zones under the caps.
5. No action in the A-zone and groundwater extraction and treatment in the B-zone	• A series of conventional extraction wells are drilled to extract the B-zone water in this action. • Pumping B-zone groundwater off-site with great number of wells could be detrimental as the pumping influences could cause the spread of contamination. • No known permits required for installation and for operations.
6. Groundwater extraction and treatment in the A-zone and the B-zone	• See alternatives 4a and 5. This action is implementable with no known permits required for installation and for operations. RCRA cap disturbance could be avoided by use of directional drilling techniques. However, technical feasibility is dependent upon the ability to conduct air through the subsurface conditions and effectiveness of dinoseb contaminated water extraction from the A-zone. These technical feasibilities, which would be determined based on field-testing, are questionable and could significantly impact implementability of the alternative. Pumping B-zone groundwater off-site could be detrimental as the pumping influences could cause the spread of contamination. • Air emissions for treatment unit will have to be controlled. • Generated waste sludges will have to be contained and proper disposal ensured.

Table 10-7
Summary Of Costs For Alternatives

Alternative Description	Estimated Costs		
	Capital and Periodic Costs	Annual O&M Costs	Most Likely Total Costs [1,2,3]
Decommission and relocate existing City Well CW1 [4]	$985,000	-	$985,000
1. No Action	$0	$333,000	$2,339,000
2. Monitored Natural Attenuation	$550,000	$525,000	$4,237,000
3. Source reduction in the A-zone and no action in the B-zone	$2,660,000	$1,700,000	$14,600,000
4a. Dual-phase extraction and treatment of vapor and groundwater in the A-zone and no action in the B-zone	$15,135,000	$4,540,000	$47,022,000
4b. In-situ bio-treatment and bio-augmentation in the A-zone and no action in the B-zone	$2,290,000	$2,110,000	$17,110,000
5. No action in the A-zone and groundwater extraction and treatment in the B-zone	$8,460,000	$4,070,000	$37,046,000
6. Groundwater extraction and treatment in the A-zone and in the B-zone	$22,165,000	$6,740,000	$69,504,000

[1] Assumes a 10-year operating life and 10 years of monitoring at the site
[2] Most likely costs are based on subjective identification of variables. A range of costs around this number would reflect the favorable and unfavorable outcome when implementing the remedial action.
[3] O&M costs are included as present value costs at a 7-percent discount rate.
[4] This action is part of all alternatives, except the No Action, and is accordingly identified separately.

10.8 State Acceptance

The State of California Department of Toxic Substances Control (DTSC) is the support agency. DTSC has provided concurrence with the selected remedy, and will participate in the remediation process. No permits are required for the implementation of on-site treatment and/or remedial actions.

10.9 Community Acceptance

The B&B Site OU-2 Proposed Plan was issued on June 21, 2007 with EPA's preferred remedy consisting of a combination of alternatives 2 (MNA for the B-zone groundwater) and Alternative 3 (Source reduction in the A-zone and No action in the B-zone), along with the relocation of the Arvin city well CW-1 to achieve the long-term goal of preventing potential future exposure to the public from contaminated groundwater. Public comment period was extended from 30 days (June 21, 2007 to July 21, 2007) to 67 days (June 21, 2007 to August 28, 2007). Two public meetings were conducted (June 21, 2007 and August 9, 2007) during the public comment period. In addition, several other meetings with City of Arvin officials, Arvin Community Service District (ACSD) representatives and Arvin Citizen Taskforce group were held during the comment period to discuss the Proposed Plan and information about the B&B Site. The community expressed some concerns and questions regarding the quality of the City of Arvin drinking water and the preferred remedy during the public meetings. Written comments were also submitted during the comment period. EPA staff addressed comments and questions that were raised at the public meetings

and the comment period. Response to the comments is included in the Responsiveness Summary provided in Part 3 of this document. EPA believes that the selected remedy addresses many of the community concerns that were identified during the comment period.

11.0 Principal Threat Wastes

The NCP establishes EPA's expectation that treatment be used to address the principal threats posed by a site wherever practical. The principal threat concept applies to the source materials at a Superfund site that are highly mobile and cannot be reliably controlled in place, or would present a significant risk to human health or the environment should exposure occur. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to the groundwater, surface water, or air or act as a source for direct exposure.

The principal or primary threat wastes at the B&B Site were the chemical spills and leaks from tanks, wastewater pond, and sumps, resulting in surface soil contamination. Infiltration of water through contaminated surface soil impacted the subsurface soil and A-zone groundwater. The principal threat wastes, tanks, ponds, sumps and contaminated surface soils, were addressed as a part of OU-1 as discussed in Section 5.5 and 5.6. The A-zone groundwater is a secondary source of the COCs, and is mobile and acts as a threat to the B-zone groundwater, and possibly the C-zone groundwater. The non-COC groundwater contaminants in the A-zone pose a risk to human health but are not laterally mobile and are characterized by relatively low concentrations within a confined area. Groundwater contamination at the B&B Site in the A-zone, a shallow aquifer not used as a potable water source, is at low concentrations and not considered to be a principal threat waste. NAPLs have not been detected in the subsurface at the B&B Site.

12.0 Selected Remedy

The remedial action for the B&B Site OU-2 addresses contaminated groundwater. To remove the potential threat to human health, the selected remedy for groundwater will use a combination of methods to achieve the Remedial Action Objectives.

EPA presented seven alternatives in the Proposed Plan prepared for B&B Site OU-2. The Remedial Action Objectives for OU-2 are to: remove or control groundwater contamination source in the A-zone; restore B-zone groundwater to its potential use as a drinking water source; and prevent future exposure to contaminated groundwater. Additionally, the relocation of the Arvin City Well CW-1 to prevent exposure to contaminated groundwater is part of all alternatives except the No Action Alternative.

A combination of Alternatives 2 and 3 were selected for the OU-2 remedy with respect to achieving drinking water MCL compliance in the B-zone groundwater. Alternative 3, consisting of the A-zone groundwater extraction and treatment, was a component of the selected OU-1 remedy in the 1993 OU-1 ROD, and was a carried over task from the OU-1. The actions in the 1993 OU-1 ROD for A-zone groundwater were interim actions. Additionally, decommissioning and relocation of Arvin City well CW-1, which is a part of all alternatives, except the No Action, will eliminate the only known potential pathway of A-zone and B-zone groundwater infiltrating the C-zone aquifer. The selected remedy is the final remedy for the B&B Site.

The selected remedy for the B&B Site OU-2 is presented below and is discussed in detail in Section 12.2 below:

1. **Relocate the Arvin City Well CW-1:** Discontinued use of the Arvin City well CW- 1 (proper plugging and abandonment of the well) will eliminate the only known potential pathway for

contamination in the A-zone and B-zone groundwater infiltrate the C-zone aquifer. The Arvin City Well will be relocated to an alternative location a suitable distance from the known B&B Site contaminant plume.

2. **Alternative 2, Monitored Natural Attenuation for Groundwater**: The ultimate objective for the groundwater remedial action is to restore contaminated groundwater in the B-zone to its beneficial use. The B-zone groundwater could be used as a future source of drinking water, but it is not being used currently for this purpose either on-site or off-site. MNA for the groundwater in the B-zone is considered by EPA to be an alternative means of achieving remediation objectives that may be appropriate for specific, well-documented site circumstances where its use meets the applicable statutory and regulatory requirements. MNA is the reliance on natural attenuation processes to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods. The natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. The fate and transport model for the Site indicate that relatively fast flow and transport in B-zone aquifer, in conjunction with source reduction/control in the A-zone, would attain COC concentrations below the drinking water MCL within a reasonable timeframe. This alternative would include appropriate evaluation process and contingencies to assure that MNA is functioning as intended. This alternative would also include additional necessary institutional controls, such as to restrict access to those portions of aquifers that are impacted and assure any wells completed in deeper zone are sealed through the A-zone and B-zone to prevent cross contamination to address potential health risks.

3. **Alternative 3, A-zone Groundwater Source Reduction:** This alternative consists of source reduction and control by dewatering the A-zone and treating the extracted water. In this alternative, several large diameter wells will be installed in specific strategic locations. The large diameter sump wells will be constructed by drilling 8-foot diameter holes at the selected locations to a depth of 75 feet or into the clay layer that separates the A-zone and B-zone. The extracted groundwater will be treated by an UV/Oxidation system located on-site. The treated water would be discharged to the Arvin City sewer. Alternatively, a service contract might be utilized for off-site treatment and disposal of the water, if such an approach is found to be cost advantageous.

EPA believes the selected remedy for the B&B Site meets the threshold criteria and provides the best balance of tradeoffs among the alternatives considered. EPA expects the selected remedy to satisfy the statutory requirements of CERCLA Section 121(b): 1) Protection of human health and the environment; 2) Compliance with ARARs; 3) Cost effectiveness; 4) Use of permanent solutions to the maximum extent practicable; 5) Application of source reduction, dewatering action in the A-zone as a principal component.

12.1 Summary of the Rationale for the Selected Remedy

The principal factors considered in choosing the selected remedy for groundwater are:

1. There is no known source material or non-aqueous phase liquids in the groundwater constituting a principal threat;

2. COCs in the A-zone groundwater are mobile and pose a threat to human health even though they exist at relatively low concentrations and can be confined to the A-zone and B-zone if the Arvin city well is properly plugged and abandoned;

3. Even though A-zone groundwater is not a current or a potential drinking water source, extraction and treatment of the A-zone groundwater is necessary as it is a source of contamination to the B-zone groundwater, classified as a potential drinking water source, and possibly to the C-zone groundwater that is a current source of drinking water;

4. Groundwater extraction in the A-zone with surface treatment of the water will control or eliminate the source of contamination to the B-zone groundwater by reducing the mobility, volume, and concentration of the contaminant plume.

5. MNA should reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater, specifically the B-zone groundwater.

12.2 Description of the Selected Remedy

The selected remedy for the B&B Site OU-2 is the combination of Alternatives 2, and 3, which are Monitored Natural Attenuation, and Source Mobility Reduction. The relocation of the Arvin City Well CW-1 to prevent future exposure to contaminated groundwater is a part of all alternatives, except the No Action; therefore, it is a component of the selected remedy. The various components of the selected remedy are described as follows:

Relocate the Arvin City Well CW-1: Eliminate the risk pathway by properly plugging and abandoning the Arvin City Well CW- 1 and install a replacement well. The C-zone aquifer is the potable water aquifer used by the City of Arvin. The Arvin City Well CW- 1 is completed with the production screen set below the B-zone and the Corcoran Clay layer but the well is reported to be gravel packed from 50 bgs (in the A-zone soils above the A-zone groundwater) to the total depth at 730 feet. This construction may provide a conduit for B-zone groundwater contamination to migrate into the C-zone.

This action consists of plugging and abandoning the CW- 1 well and installing a replacement well outside the known extent of the B&B Site contaminant plume. This would eliminate the potential exposure pathway for contaminated groundwater ingestion.

Monitored Natural Attenuation for groundwater in the B-zone.

Monitored Natural Attenuation (MNA) refers to the reliance on natural attenuation processes to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods. The natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization and chemical or biological stabilization, transformation, or destruction of contaminants. EPA does not view MNA to be a "no action" or "walk-away' approach, but rather considers it to be an alternative means of achieving remediation objectives that may be appropriate for specific, well-documented site circumstances where its use meets the applicable statutory and regulatory requirements. The fate and transport model for the Site indicate that relatively fast flow and transport in the B-zone aquifer would attenuate COC concentrations below the drinking water MCL within a reasonable timeframe, if the source, which is COCs in the A-zone groundwater, is reduced or controlled.

MNA is typically used in conjunction with active remediation measures. For example, active remedial measures could be applied in areas with high concentrations of contaminants while MNA is used for low concentration areas; or MNA could be used as a follow-up to active remedial measures, such as source

mobility reduction or source removal.

The use of MNA at a site does not preclude the use of "active" remediation of or the application of enhancers of biological activity *(e.g.,* electron acceptors, nutrients, and electron donors).

The groundwater monitoring associated with the MNA will consist of sampling and analysis of key monitoring wells. Analytical results would be compiled and presented to EPA with interpretation and graphics showing COC concentration contour maps. The remedial action cleanup levels for the B-zone groundwater (drinking water MCLs) presented in Section 12.4.2 will be used as a guide for evaluating the natural attenuation process. The monitoring schedule will be quarterly during the first year, semi-annually during the second year, and annually thereafter. Monitoring frequency could be adjusted, depending on the analytical results and with EPA approval.

EPA will develop an MNA performance plan during implementation of the remedy. The MNA Plan will include details of the groundwater monitoring and natural attenuation progress evaluation for the B-zone groundwater. Actual performance of the natural attenuation remedy will be carefully monitored in accordance with the MNA Plan. If monitoring data indicate that the COC levels do not continue to decline, EPA and DTSC will reconsider the remedy decision. If monitoring and evaluations indicate that the B-zone groundwater COC concentrations are not attenuating as expected, after controlling the source of contamination (the COC impacted A-zone groundwater) appropriate measures will be implemented to address contamination in the B-zone groundwater. The MNA performance plan will also include necessary monitoring requirements for contaminated groundwater plume containment evaluation. The purpose of the B-zone containment evaluation is to ensure that the groundwater contamination is not migrating, and becoming a risk to human health and the environment. Boundaries of the leading edge plume will be established for appropriate containment evaluation. If the containment evaluation indicates that the B-zone groundwater is migrating such that it creates a risk to human health or the environment, appropriate containment will be evaluated and contamination migration will be addressed. In addition, the effectiveness of the MNA program will be evaluated at the end of five years.

This alternative will also include additional institutional controls to address potential health risks and maintain effectiveness of remediation. These controls would include necessary deed and zoning restrictions (short-term or long-term) and/or permit requirements that will restrict access to portions of aquifers impacted by COCs to prevent exposure to contaminated water and spread of contamination. The objective of the institutional controls is to:

- prevent completion of wells in portions of aquifers impacted by COCs, and assure appropriate completion of wells in deeper aquifer (C-zone) to seal off impacted groundwater zones and aquifer units to avoid cross contamination,

- restrict well drilling and groundwater pumping within at least half a mile from the Site to ensure that pumping influences do not spread contamination and reduce the effectiveness of the remedy.

These controls will remain in effect until the remedy has restored the impacted groundwater to the cleanup levels. Specifics of the institutional controls, necessary to effectively implement the remedy and to address the potential health risks, will be assessed and developed during the remedy implementation.

A-zone Groundwater Source Reduction

This alternative consists of dewatering in the A-zone and treating the extracted water. The treated groundwater is then discharged to the Arvin City sewer. The most optimum location for such a dewatering

system would be where either current groundwater depressions exist or where the B-zone aquifer is most impacted south of the B&B Site.

In this alternative, several large diameter wells will be installed off-site in the locations described above. Up to four large-diameter sump wells will be constructed by drilling 8-foot diameter holes at the select locations to a depth of 75 feet or into the clay layer that separates the A-zone and B-zone. Because this clay layer is relatively thin, field procedures will be required to ensure that penetration into the clay is minimal to avoid breaching it, but sufficient to allow the well to serve as a sump for A-zone water. It is expected that about 1-foot penetration into the clay layer will allow these objectives to be met. The drill hole will be encased with a CMP Pipe and the lower *25* feet will be filled with gravel. A 12-inch poly-vinyl-chloride pipe that is open-screened in the gravel-filled zone will be installed to the base of the well for extraction of the collected water in the well.

It is expected that an average of 15 to 150 gallons per day of water may be extracted from the A-zone using this approach. At peak this may approach or slightly exceed 1,000 gallons per day. There appear to be two options available to manage this extracted contaminated water: 1) temporarily store the water at the site and periodically transport off-site for treatment and disposal; and 2) use an UV/Oxidation treatment system installed at the non-RCRA cap portion of the site for treatment and discharge of the treated water to the Arvin City sewer. A cost-benefit assessment is needed at the time the remedy is implemented to assess which of these options is better.

In the design of the water pumping system, it will be required that the scheme allows for periods of time where the wells are dry. After several years of operation, it may be that the A-zone water occurs only on a seasonal and periodic basis. Because of the presence of the A-zone RCRA and non-RCRA caps, the replenishment of the A-zone from infiltration from the B&B Site areas will be limited allowing for little flushing of the soil contamination that remains. As the remediation progresses, site observations will allow better evaluation of the availability of water in the A-zone and the effectiveness of its dewatering. To the extent that methods are available to improve the process by increased "flushing" of the contaminants, these may be considered as system enhancements at a later stage.

Periodic monitoring of the A-zone and B-zone groundwater is needed to assess the changing site conditions and the impact of the installed remediation system. It is expected that this monitoring will extend until the OU-2 goal of limiting the B-zone groundwater to COC MCL levels is achieved and there is no further threat to the B-zone groundwater from the A-zone contamination. The remedial action cleanup level goals for A-zone groundwater (10 times the contaminant MCLs) presented in Section 12.4.2 will be used as a guide for evaluating the progress of the remedial action. It is estimated that it will take ten years to remediate A-zone groundwater so that it is no longer a source of contamination to the B-zone groundwater.

12.3 Summary of the Estimated Remedy Costs

Cost estimates for moving or replacing the Arvin City Well CW-1 and the two selected alternatives are summarized in Table 12-1. The capital costs, operation and maintenance costs, and periodic costs for these alternatives are described in detail on Tables 12-2, 12-3, and 12-4, respectively. These estimates for MNA Alternative 2 and Source Reduction Alternative 3 do not include the cost for moving or replacing the Arvin city well CW-1, since it is a part of all alternatives and is separately identified on Table 12-1 as a line item.

The cost data is based on the most likely estimate of costs for the three alternatives. Cost estimates include implementation of remedy, periodic monitoring, and assessment for effectiveness. These costs do not include ancillary costs such as permits and hazardous waste transportation and disposal. Also, ancillary costs of oversight and interaction with third parties has not been included in the estimates.

Table 12-1
Summary of Costs For the Selected Remedy

Alternative	Description	Estimated Costs		
		Capital and Periodic Costs	Annual O&M Costs	Most Likely Total Costs [1,2,3]
-	Decommission existing well and Relocate City Well CW1 [4]	$985,000	-	$985,000
2	Monitored Natural Attenuation	$550,000	$525,000	$4,237,000
3	Source reduction in the A-zone and No action in the B-zone	$2,660,000[5]	$1,700,000[5]	$14,600,000[5]
TOTAL		**$3,645,000[5]**	**$1,700,000[5]**	**$15,585,000[5]**

[1] Assumes a 10-year operating life and 10 years of monitoring at the site
[2] Most likely costs are based on subjective identification of variables. A range of costs around this number would reflect the favorable and unfavorable outcome when implementing the remedial action.
[3] O&M costs are included as present value costs at a 7-percent discount rate.
[4] This action is part of all alternatives, except the Alternative 1 (NO Action), and is accordingly identified separately.
[5] Cost estimate for MNA is included in the Alternative 3 cost estimate.

Table 12-2
Capital Cost Summary For the Selected Remedy

Alternative	Description	Quantity	Unit	Unit Cost	Total Cost
2	**Monitored Natural Attenuation**	1	None	None	No new wells Identified
3	**Source reduction in the A-zone and No action in the B-zone**				
	Installation of Sump Wells (4)				**1,282,250**
	Install Sump wells w/CMP Casing	300	feet	2,250	675,000
	Extraction Pumps/equipment	4	each	50,000	200,000
	Equipment and Labor	4	each	60,000	240,000
	Engineering Costs (15%)	-	-	-	167,250
	UV/Oxidation Treatment System				**770,000**
	Treatment System for 150 gpm	1	each	770,000	770,000
	Treatment Water Disposal				**57,500**
	Equipment and Labor	1	each	50,000	50,000
	Engineering Costs	-	-	-	7,500
	TOTAL COSTS				**$2,110,000**

Table 12-3
Annual Operations And Maintenance Cost Summary For the Selected Remedy

Alternative	Description	Quantity	Unit	Unit Cost	Total Cost
2	**Monitored Natural Attenuation**				**384,200**
	Groundwater sampling & analysis (semi-annually)				
	Mobilization & Demobilization	4	quarters	13,500	54,000
	On-site Sampling	136	well	750	102,000
	Laboratory Analysis	136	well	825	112,200
	Report Preparation	4	each	16,000	64,000
	Data Validation & QA/QC	4	each	11,000	44,000
	IDW Disposal	4	each	2,000	8,000
	RCRA Cap Maintenance				**65,000**
	Inspection	2	each	7,500	15,000
	Repair & Maintenance	1	year	50,000	50,000
	Non-RCRA Cap Maintenance				**42,000**
	Inspection	2	each	6,000	12,000
	Repair & Maintenance	1	year	30,000	30,000
	Site Maintenance				**18,000**
	Cleanup & Housekeeping	1	year	6,000	6,000
	Repairs & Maintenance	1	year	12,000	12,000
	Project Oversight				**15,600**
	Meeting & Reviews	8	hrs/mth	100	9,600
	Reporting	4	quarterly	1,500	6,000
				Total Costs	**$525,000**
3	**Source reduction in the A-zone and No action in the B-zone**				
	Same as Alternative 2				**525,000**
	Maintenance of Sump Wells				**160,000**
	Reporting & Oversight for Disposal Systems				**120,000**
	Maintenance of Treatment System				**500,000**
	Contingency (30%)				**391,500**
				Total Costs	**$1,700,000**

Table 12-4
Periodic Cost Summary For the Selected Remedy

Alternative	Description	Quantity	Unit	Unit Cost	Total Cost
2	**Monitored Natural Attenuation**				
	Repair Site Drainage				**326,025**
	Apply Asphalt	115000	Sq. ft.	1.70	195,500
	Labor & Equipment	1	each	88,000	88,000
	Engineering Costs (15%)	-	-	-	42,525
	Decommission Existing On-site Wells				**223,560**
	Abandon Wells	880	lin. Ft.	130	114,400
	Labor and Equipment	1	each	80,000	80,000
	Engineering Costs (15%)	-	-	-	29,160
				Total Costs	**$550,000**
3	**Source reduction in the A-zone and No action in the B-zone**				
	Same as Alternative 2				**550,000**
				Total Costs	**$550,000**

The site area, volume of groundwater requiring remediation, and estimated cycle volume required for remediation to the MCLs are taken from the May 1993 RI/FS Report for OU-1, specifically as these relate to A-zone contamination that is reviewed in the RI/FS Report under source reduction for the B-zone.

The cost summary tables are based on the best available information regarding the anticipated scope of the remedial action. Changes in the cost elements are likely to occur as a result of the new information and data collected during the remedial design phase. Major changes may be documented in the form of a memorandum to the Administrative Record file, or a ROD amendment.

12.4 Expected Outcome of the Selected Remedy

The selected remedy for groundwater is expected to remove and treat the A-zone COCs impacted groundwater. This action will reduce the mass, toxicity, mobility, volume, or concentration of contaminants in the A-zone groundwater and significantly slow or stop the infiltration of the contaminated A-zone groundwater into B-zone aquifer. With reduction of contaminant infiltration from the A-zone, monitored natural attenuation is expected to attenuate COC concentrations below the drinking water MCLs in the B-zone aquifer within a reasonable time frame. Plugging and abandoning the Arvin City Well CW-1 will eliminate a possible conduit for the A-zone and B-zone groundwater from infiltrating the C-zone potable water aquifer.

12.4.1 Available Use After Cleanup

The B&B Site is located at 600 South Derby Street in the City of Arvin, California approximately 18 miles southeast of the City of Bakersfield. Arvin is primarily an agricultural community and the site is located in a light industrial and commercial area of Arvin. Located west of the site is a residential area including two schools and a park within 0.5 miles of the site and a Pre-School, located within one mile of the site. The

majority of the land in the Arvin area is devoted to agriculture purposes; farm land, crop processing; storage, and shipping facilities, and agricultural equipment service facilities.

Future reasonably anticipated land use options for the B&B Site include light industrial and low density commercial. Due to the proximity of the B&B Site property to a railroad spur, future land use options should remain as light to medium industrial and low density commercial. New zoning restrictions may be enacted to conform to any changes made to land use designations as land development and use options are reviewed and implemented by the City of Arvin. However, RCRA cap and requirement for maintaining its effectiveness, for preventing any direct exposure to impacted surface soil and infiltration of surface water through the impacted surface and subsurface soils, would limit any development at the Site.

The contaminated groundwater under the B&B Site is semi-confined in the upper A-zone aquifer and characterized as shallow groundwater of marginal quality water and low yield. The A-zone aquifer occurs because of the nearby agricultural crop irrigation, seasonal rainfall infiltration, and in the past by leakage from the B&B Site holding ponds. The A-zone aquifer is not considered a potential drinking water source and there are no other potential beneficial uses associated with groundwater in the A-zone due to the very low well yields. However, its contamination poses a threat to the underlying aquifers because of the vertical percolation of the groundwater from the A-zone to the B-zone. Although the B-zone aquifer is not currently used as a drinking water source, it is classified by the CVRWQCB as a potential drinking water source, and other future beneficial uses for the B-zone aquifer could include agricultural, industrial process, and industrial services.

The potential for on-site residential land use, which includes groundwater at the B&B Site being used as a drinking water source, is the most conservative scenario used as a basis for the reasonable exposure assessment assumptions and risk characterization conclusions that prompted the remedial action objectives for the B&B Site. Once implemented, the selected remedy for groundwater will protect the existing beneficial uses of the deeper C-zone aquifer, will achieve MCL compliance at the potential point of exposure in the B-zone aquifer and will reduce the contaminate concentrations in the A-zone, the source of contamination to deeper beneficial aquifers.

12.4.2 Final Cleanup Levels

Although, the B-zone aquifer is not currently used as a drinking water source, it is classified by the CVRWQCB as a potential drinking water source. Therefore, groundwater cleanup levels are based on groundwater chemical specific ARARs, which are based on protection of human health. When an MCL has been promulgated, the final cleanup levels for the B-zone aquifer are Federal drinking water MCLs, unless State drinking water MCLs are more stringent. Since there is no MCL for 1,2,3-TCP, the cleanup level for this contaminant is based on CDHS's Drinking Water Notification Levels and Response Levels, which is used as a to-be-considered (TBC) criteria. Table 12-5 presents the B-zone groundwater cleanup levels based on the groundwater chemical specific ARARs, drinking water MCLs, and the source of the ARARs.

A-zone groundwater is a source of contamination to the B-zone groundwater. The goal for the A-zone groundwater is to control the migration of contaminants by controlling the groundwater flow or reducing the concentrations of COCs in the A-zone to the extent that it is no longer a threat to the B-zone groundwater. Based on two modeling results for movement of COCs though the A-zone groundwater to the B-zone groundwater during the OU-1 RI, clean-up goals for the A-zone groundwater were set in the November 1993 OU-1 ROD at a range of ten and one hundred times the respective MCLs as presented in Table 12-6. The OU-1 ROD further specified that after the A-zone groundwater extraction system is in operation, the final A-zone groundwater cleanup goals will be established within the above stated range based on costs and effectiveness for reducing and maintaining COC concentrations at or below MCLs levels in the B-zone groundwater. The ultimate goal at the Site is to protect the B-zone groundwater by

attaining the cleanup levels specified in Table 12-5 for the B-zone groundwater.

Table 12-5
Cleanup Levels for B-zone Groundwater

Contaminant of Concern	Maximum Contaminant Level (µg/L)[1]	Source
Chloroform	80[2]	Federal National Primary Drinking Water Standards *(40 CFR Part 141)*
1,2-Dibromo-3-chloropropane (DBCP)	0.2	Federal National Primary Drinking Water Standards *(40 CFR Part 141)*
1,2-Dichloropropane (1,2-DCP)	5	Federal National Primary Drinking Water Standards *(40 CFR Part 141)*
1,3-Dichloropropane (1,3-DCP)	0.5	California Safe Drinking Water Act (*CCR, Title 22, Sec 64444*)
Dinoseb	7	Federal National Primary Drinking Water Standards *(40 CFR Part 141)*
Ethylene Dibromide (EDB)	0.05	Federal National Primary Drinking Water Standards *(40 CFR Part 141)*
1,2,3-Trichloropropane (1,2,3-TCP)	0.5	Response Level, Drinking Water Program, California Department of Health Services, 1999; and available analytical practical quantification limit for 1,2,3-TCP.

Notes: [1] microgram per liter

[2] Total Trihalomethanes (sum of bromodichloromethane, dibromochloromethane, bromoform and chloroform), EPA MCL effective 01/01/04.

Table 12-6
Cleanup Goals for A-zone Groundwater

Contaminant of Concern	A-zone Groundwater Cleanup Goal (µg/L)[1]
Chloroform	800 – 8,000
1,2-Dibromo-3-chloropropane (DBCP)	2 - 20
1,2-Dichloropropane (1,2-DCP)	50 - 500
1,3-Dichloropropane (1,3-DCP)	5 - 50
Dinoseb	70 - 700
Ethylene Dibromide (EDB)	0.5 – 5.0
1,2,3-Trichloropropane (1,2,3-TCP)	5 - 50

Note: [1] Microgram per liter,

13.0 Statutory Determination

Under CERCLA § 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes.

13.1 Protection to Human Health and the Environment

The selected remedy for groundwater, a combination of Alternatives 2, and 3, with relocation of the Arvin City well CW-1 and institutional controls will protect human health and the environment by dewatering the A-zone and treating the removed water. Source reduction in the A-zone will reduce contaminant mass, toxicity, mobility and volume, and limit the amount of contaminants that could migrate vertically and contaminate the B-zone groundwater. With reduction and control of contaminant vertically migrating from A-zone, monitored natural attenuation will reduce COC concentrations below the drinking water MCLs in the B-zone aquifer. Plugging and abandoning the Arvin City Well CW-1 will eliminate a possible conduit for the A-zone and B-zone groundwater from infiltrating the C-zone potable water aquifer and eliminate the potential exposure pathway for drinking water. Implementing appropriate institutional controls will protect human health until remedial action objectives are achieved.

As part of the RI/FS, EPA conducted a Human Health Risk Assessment to determine the current and future effects of COCs on human health. The area around the B&B Site is utilized for mixed residential and agricultural purposes. A city water production well, Arvin City Well CW-1 is located approximately 1,500 feet southwest of the B&B Site, and is a potential conduit of contamination from the A-zone and B-zone to the C-zone. Hence, the risk assessment focused on potential health effects for five receptors under both current and future site conditions. The receptors are as follows:

- On-site maintenance worker
- On-site commercial/industrial worker
- Off-site residents (adult)
- Off-site resident (child)
- Off-site commercial/industrial worker

Under the current exposure scenario the carcinogenic risks for all receptors are within the 10^{-4} to 10^{-6} risk management goal stipulated by EPA, yet the on-site industrial worker exceeds the risk level of 1 in 1,000,000 typically applied by the State of California. The potential risks to this receptor are associated with potential indoor air exposures to contaminants originating from the underlying soils and groundwater.

This pathway becomes more prevalent in the future exposure scenario when the A-zone contaminants are projected to migrate off-site. The vapor emissions from these projected off-site sources are responsible for all long-term receptors exceeding the de minimis risk and in select cases EPA target range of 10^{-4} (1 in 10,000) to 10^{-6} (1 in 1,000,000). The only receptor shown to be below the de minimis level is the on-site maintenance worker.

This risk assessment has shown, in a conservative manner using EPA and California EPA guidance, that the COCs may pose a hazard to potential receptors if not controlled. It is EPA's current judgment that the Selected Alternatives identified in this document, or other measures considered in this document, are necessary to protect the public health or welfare from health risk as a result of exposure to COCs.

13.2 Compliance with Applicable or Relevant and Appropriate Requirements

Remedial actions selected under CERCLA must comply with ARARs under federal environmental laws, or where more stringent than the federal requirements, state environmental or facility siting laws. Where a State has been delegated authority to enforce a federal statute, such as RCRA, the delegated portions of the statute are considered to be a federal ARAR unless the state law is broader or more stringent than the federal law.

The ARARs are identified on a site-specific basis from information about site-specific chemicals, specific actions that are being considered, and specific site location features. There are three categories of ARARs:

1. chemical-specific requirements,
2. location-specific requirements, and
3. action specific requirements

Where there is no chemical-, location-, or action-specific ARARs EPA may consider non-promulgated federal or state advisories and guidance as to-be-considered (TBC) criteria. Although consideration of TBC criteria is not required, standards based on TBC's are legally enforceable as performance standards.

Chemical-specific ARARs are risk-based standards or methodologies that may be applied to site-specific conditions and results in the development of cleanup levels for the COCs at the B&B Site.

Location-specific ARARs are restrictions placed on the chemical contaminant or the remedial activities based on a geographic or ecological feature. Examples of features include wetlands, floodplains, sensitive ecosystems and seismic areas.

Action-specific ARARs are usually technology- or activity-based requirements. They are triggered by the particular remedial activities selected to accomplish a remedy.

A summary of ARARs and TBC criteria for the selected remedy are presented in Table 13-1.

13.3 Cost Effectiveness

In EPA's judgment, the selected remedies for groundwater are cost-effective. According to the NCP, a remedy is cost-effective if its costs are proportional to its overall effectiveness. The overall effectiveness of the selected remedies for groundwater was demonstrated in the comparative analysis of the alternatives. The selected remedies satisfy the threshold criteria (overall protectiveness and compliance with ARARs), while scoring highly with respect to the three balancing criteria of long-term effectiveness, reduction in toxicity, mobility, and volume through treatment, and short-term effectiveness.

The overall effectiveness of the alternative was evaluated with respect to the respective cost estimates. Because the selected remedies for groundwater provide effective and permanent solutions in a relatively short time frame, the overall cost of implementation may be higher or lower relative to less effective alternatives.

The selected remedy for groundwater, a combination of alternatives 2 and 3 with relocation of Arvin City well CW-1, includes the use of extraction and treatment of groundwater. The extraction and treatment of the A-zone groundwater when compared to monitored natural attenuation alone may result in overall costs savings because of the expected reduction in time required to reach remedial action goals. For cost estimating purposes, however, no reduction in remedial action time or effort was assumed. Provided the results of pumping adequate amounts of groundwater from the sump wells completed in the A-zone are positive, EPA believes that use of the selected alternatives in concert is more cost effective than any stand-alone, individual alternatives presented in the feasibility study.

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Table 13-1
ARARs for the Selected Remedy

Authority	Medium	Legal Authority	Status	Synopsis of Requirement	Actions to be Taken to Attain Requirement
CHEMICAL-SPECIFIC ARARs					
Federal Regulatory Authority	Groundwater	Federal Primary Drinking Water Standards 40 CFR Part 141	Relevant and appropriate	Federal drinking water standards protect the public from contaminants that may be found in drinking water. The B-zone groundwater at the B&B Site is a potential source of drinking water.	The selected remedy will use federal MCLs, unless State MCLs are more stringent, as cleanup levels for COCs in groundwater and to protect groundwater from soil contaminants.
State Regulatory Authority	Groundwater	California Primary Drinking Water Standards H&S Code §4010 et seq. 22 CCR §64431 and 64444	Relevant and Appropriate	California drinking water standards protect public health from contaminants found in drinking water sources. The B-zone groundwater at the B&B Site is a potential source of drinking water.	The selected remedy will use state MCLs more stringent than federal MCLs as cleanup levels for COCs in groundwater and to protect groundwater from soil contaminants.
State Regulatory Authority	Groundwater	SWRCB Resolution No. 92-49 III G Subpart 3, Policy and Procedures for Investigation and Cleanup and Abatement of Discharges under California Water Code §13304 (amended 4\21\94) California Water Code §13307 23 CCR §2550.4	Relevant and appropriate	To protect groundwater, the resolution requires cleanup to either background water quality or the best water quality that is reasonable if background water quality cannot be restored. Non-background cleanup levels must be consistent with maximum benefit to the public, present and anticipated future beneficial uses, and conform to water quality control plans and policies.	Groundwater will be cleaned up to MCLs for COCs or to attain the best water quality that is reasonable.
LOCATION-SPECIFIC ARARS					
State Regulatory Authority	Soil and groundwater	Prohibition-Destruction of Bird Eggs and Nests Fish & Game Code §3503	Applicable	This law prohibits take, possession, or needless destruction of any bird nests and eggs, except as provided by the Fish and Game Code or regulations.	Project construction of the selected remedy will comply with this requirement.

Table 13-1 (continued)
ARARs for the Selected Remedy

Authority	Medium	Legal Authority	Status	Synopsis of Requirement	Actions to be Taken to Attain Requirement
State Regulatory Authority	Soil and groundwater	Non-Game Animals Fish & Game regulations 14 CCR §472	Applicable	Regulation provides that non-game birds and mammals may not be taken except from English sparrow, starling, coyote, weasels, skunks, opossum, moles, and rodents (excludes tree and flying squirrels, and those listed as furbearers, endangered, or threatened species); and American crows.	Project construction of the selected remedy will not result in a "'take" and will comply with this requirement.
ACTION-SPECIFIC ARARS					
Federal Regulatory Authority	Surface water	NPDES Non-Point Source Discharge 40 CFR §122.26	Relevant and appropriate	Non-point sources address using best management practices for control of contaminants to storm water run-off from construction activities on sites greater than 1 acre.	Since alternatives that evaluate soil excavation are confined to less than one acre. The requirement is not applicable but is relevant and appropriate. BMPs will be established to prevent storm water run-off.
State Regulatory Authority	Groundwater	Non-Degradation Policy SWRCB Resolution No. 68-16 Water Code §13140	Applicable	Requires maintaining the existing water quality using best practicable treatment technology unless a demonstrated change will benefit the people of California, will not unreasonably affect present or potential uses, and will not result in water quality less than that prescribed in other state policies. Determination is made through a two-step process to determine (1) whether further degradation may be allowed, and (2) the discharge level, which will result in the best practicable treatment or control of the discharge.	Anti-degradation requirements will be addressed to prevent further degradation of the water during and at completion of the cleanup action, for re-injection or discharge of treated groundwater. Any re-injection of water or chemical injection will be conducted in the plume to prevent further degradation where possible. The selected remedy will comply with the substantive RWQCB WDRs for chemical injection and re-injection.
State Regulatory Authority	Soil	California Water Code §13140-13147, 13172, 13260, 13263, 132267, 13304, 27 CCR Div.2, Subdiv.1, Chap.3, Subchap.2, Art.2	Applicable	Wastes classified as threat to water quality (designated waste) may be discharged to a Class I hazardous waste or Class II designated waste management unit. Nonhazardous solid waste may be discharged to a Class I, II, or III waste management unit. Inert waste would no be required to be discharged into an SWRCB-classified waste management unit.	Waste will be classified for disposal to appropriate permitted off-site waste management units. CERCLA waste (e.g., contaminated soil, IDW, spent GAC) would be disposed at an off-site disposal facility.
State Regulatory Authority	Groundwater	Sources of Drinking Water SWRCB Resolution No. 88-63	Applicable	This policy specifies that ground and surface waters of the state are either existing or potential sources of municipal and domestic supply.	The requirement establishes the B-zone groundwater at the B&B Site as a potential source of drinking water. The selected remedy will apply a groundwater cleanup level protective of drinking water.

Table 13-1 (continued)
ARARs for the Selected Remedy

Authority	Medium	Legal Authority	Statue	Synopsis of Requirements	Action to be taken to Attain Requirement
State Regulatory Authority	Soil and groundwater	Hazardous waste regulations Identification and Listing of Hazardous Waste 22 CCR Div. 4.5 Chap. 11 22 CCR §66264.13 22 CCR §66260.200	Applicable	A generator must determine if the waste is classified as a hazardous waste in accordance with the criteria provided in these requirements.	The selected remedy will comply with the waste classification requirements to determine proper disposal of waste. Waste characteristics of treated soil and groundwater will be defined prior to treatment and disposal.
State Regulatory Authority	Soil and groundwater	Hazardous waste regulations Standards Applicable to Generators of Hazardous Waste 22 CCR Div. 4.5 Chap. 12	Relevant and appropriate	Establishes waste storage timeframes on site. The purpose of the 90-day storage limit is to prevent creating a greater environmental hazard than already exists at the B&B Site.	Waste contained on site will be maintained in a container in good condition prior to off-site disposal.
State Regulatory Authority	Soil and groundwater	Hazardous waste regulations Hazardous Waste Security 22 CCR §66264.14	Relevant and appropriate	A treatment facility should maintain a fence in good repair, which completely surrounds the active portion of the facility. A locked gate at the facility should restrict unauthorized personnel entrance. The security standards to prevent entry from unauthorized personnel for the proposed remedial treatment alternatives should be applied.	The selected remedy will comply with the security requirements around the treatment plant.
State Regulatory Authority	Soil and groundwater	Hazardous waste regulations Preparedness and Prevention 22 CCR Div. 4.5, Chap. 14, Art. 3	Relevant and appropriate	Facility design and operation to minimize potential fire, explosion, or unauthorized release of hazardous waste.	The selected remedy will comply with the design requirements.

Table 13-1 (continued)
ARARs for the Selected Remedy

Authority	Medium	Legal Authority	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
State Regulatory Authority	Soil and groundwater	Hazardous waste regulations Hazardous Waste Facility General Inspection Requirements and Personnel Training 22 CCR §66264.15 - 66264-16	Relevant and appropriate	The hazardous waste facility standards require routine facility inspections conducted by trained hazardous waste facility personnel. Inspections are to be conducted at a frequency to detect malfunctions and deterioration, operator errors, and discharges which may be causing or leading to a hazardous waste release and a threat to human health or the environment.	The treatment system will comply with this requirement and provide treatment system inspections for malfunctions and deterioration.
State Regulatory Authority	Groundwater	Hazardous waste regulations Water Quality Monitoring and Response Systems for Permitted Systems 22 CCR Div. 4.5, Chap. 14, Art. 7	Relevant and appropriate	The requirements present the groundwater monitoring system objectives and standards to evaluate the effectiveness of the corrective action program (remedial activities). After completion of the remedial activities and closure of the facility, groundwater monitoring will continue for an additional three years to ensure attainment of the remedial action objectives.	The selected remedy will comply with these requirements by monitoring to demonstrate all the COCs concentrations are reduced to levels below cleanup levels.
State Regulatory Authority	Soil and groundwater	Hazardous waste requirements Closure and Post-Closure 22 CCR Div. 4.5, Chap. 14, Art. 7	Relevant and appropriate	The closure and post-closure requirements establish standards to minimize maintenance after facility closure to protect human health and the environment. The closure and post-closure requirements may be dependent upon the treatment alternatives.	The selected remedy will comply with these requirements. Specific closure conditions of the treatment facilities will be provided in a site closure report after completion of the remedial action.
State Regulatory Authority	Soil and groundwater	Hazardous waste regulations Use and Management of Containers 22 CCR Div. 4.5, Chap. 14, Art. 9	Relevant and appropriate	Maintain container and dispose to a Class I hazardous waste disposal facility within 90 days. The 90-day storage limit prevents greater environmental hazard than already exists. Maintaining the containers in good conditions at all times and not creating an environmental hazard is relevant and appropriate.	Storage of investigation-derived waste (i.e., soil cuttings from well development) will occur. Requirements may apply for the storage of contaminated groundwater and sediments trapped by the bag filter during start-up operation. Waste contained on site will be maintained in a container in good condition prior to off-site disposal.
State Regulatory Authority	Groundwater	Hazardous waste regulations Tank Systems 22 CCR Div. 4.5, Chap. 14, Art. 10	Relevant and appropriate	Minimum design standards (i.e., shell strength, foundation, structural support, pressure controls, seismic considerations) for tank and ancillary equipment are established. The requirements for minimum shell thickness and pressure controls to prevent collapse or rupture prevents a greater environmental hazard than already exist.	The selected remedy will comply and treatment system design requirements not to create an environmental hazard greater than already exists.

Table 13-1 (continued)
ARARs for the Selected Remedy

Authority	Medium	Legal Authority	Status	Synopsis of Requirement	Actions to be Taken to Attain Requirement
State Regulatory Authority	Soil and groundwater	Hazardous waste regulations Miscellaneous Units 22 CCR Div. 4.5, Chap. 14, Art. 16 22 CCR §66264.601 - 66264.603	Relevant and appropriate	Minimum performance standards are established for miscellaneous equipment to protect health and the environment. "miscellaneous unit" are units that are not a container, tank, surface impoundment, pile, land treatment unit, landfill, incinerator, boiler other than industrial furnaces (i.e., injection wells, treatment system).	None of the COCs are classified as hazardous waste. The Selected remedy will comply with those environmental performance standards to protect human health and the environment in the treatment system design and construction.
State Regulatory Authority	Soil and groundwater	CCR, title 22, section 67391.1(a) DTSC Land use covenant	Relevant and appropriate	Requires imposition of appropriate limitations on land use by recorded land use covenant when hazardous substances remain on the property at levels that are not suitable for unrestricted use of the land.	The selected remedy will comply with this requirement. Land and groundwater use restrictive covenants will be recorded.
State Regulatory Authority	Soil and groundwater	CCR, title 22, section 67391.1(d), DTSC Land use covenant	Relevant and appropriate	Requires that the land use covenant be recorded in the county where the land is located.	The selected remedy will comply with this requirement. Land use covenant will be recorded in the Kern County, California.
State Regulatory Authority	Soil and groundwater	CCR, title 22, section 67391.1(f) DTSC Land use covenant	Relevant and appropriate	Requires that whenever it is not feasible to record a land use covenant for a site, other mechanisms will be used to ensure that future land use will be compatible with the levels of hazards, which remain on the property.	The selected remedy will comply with this requirement by using other available mechanisms to ensure that future land use will be compatible with the levels of hazards which remain on the property if it is not feasible to record a land use covenant
State Regulatory Authority	Soil and groundwater	CA Civil Code Section 1471(a) & (b)	Relevant and appropriate	Specifies requirements for land use covenants to apply to successors in title to the land.	The selected remedy will comply with this requirement for land use covenant to apply to successors in title to the land.
TO-BE-CONSIDERED CRITERIA					
TBC	Groundwater	California Well Standards California Department of Water Resources Bulletin 74-90	To-be-considered	Provides minimum specifications for monitoring wells, extractions wells, injection wells, and exploratory borings. Design and construction specifications are considered for constructions and destruction of wells and borings.	Extraction and injection well sitting requirements are inappropriate for the B&B Site because the effectiveness of the remedy is dependent upon well locations. Wells constructed for the selected remedy (i.e., extraction wells, injection wells, monitoring well, soil vapor wells) will be constructed to meet the minimum state standards.
TBC	Groundwater	CDHS's draft Drinking Water Notification Level and Response Level	To-be-considered	If finalized, this provision would require water purveyors to notify customers if 1,2,3-TCP exceeds the standard	The selected remedy will use this TBC unless more stringent MCLs are promulgated for this COC in groundwater

13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA believes that the selected remedy for groundwater represents the maximum extent to which permanent and alternative solutions can be used in a practical manner at the B&B Site. As shown in Table 10-1 through 10-7, the selected remedies for groundwater satisfy the threshold criteria of overall protection and compliance with ARARs, while scoring competitively with respect to the five balancing CERCLA criteria, An evaluation of the selected remedies with respect to the balancing and modifying criteria follows.

The selected remedy for groundwater includes the combination of alternatives that were presented in the B&B Proposed Plan, The alternatives are: Relocating the Arvin City Well CW- 1; Monitored Natural Attenuation of the groundwater in the A-zone and B-zone; and Installation of a dewatering system in the A-zone aquifer with above-groundwater treatment and disposal.

Relocating the Arvin City Well CW-1

This alternative consists of properly plugging and abandoning the Arvin City well CW-1 and relocating the well to an alternative location at a suitable distance from the known B&B Site OU-2 plume. This would eliminate the potential exposure pathway for contaminated groundwater reaching receptors and the potential for A-zone and B-zone contamination to reach the C-zone.

Long-term Effectiveness and Permanence: The selected remedy is expected to be highly effective and permanent because it eliminates the risk pathway by properly plugging and abandoning the existing Arvin City Well CW-1 and relocating it to an alternative location at a suitable distance from the known B&B Site OU-2 plume.

Reduction of Toxicity. Mobility, or Volume through Treatment: This action does not reduce the toxicity or volume of COCs but will reduce the mobility by eliminating a possible conduit (Arvin City Well CW- 1) to the deeper drinking water aquifer.

Short-term Effectiveness: Highly effective and permanent. Does not pose a significant risk during implementation. Risk pathway to receptors eliminated.

Implementability: Proper abandonment and replacement well construction of the Arvin City well CW- 1, is off-site and will not interfere with on-site remedial activities.

Costs: The selected remedy is cost effective.

State Acceptance: The DTSC has accepted this component of the selected remedy.

Community Acceptance: The community has accepted relocation of the City Well CW-1.

Monitored Natural Attenuation of the groundwater in the B-zone

This alternative is to monitor the site conditions, specifically the groundwater concentrations of COCs in the A-zone and the B-zone. The monitoring would observe the progress of natural processes in mitigating the COC concentrations in the groundwater.

Long-term Effectiveness and Permanence: MNA over the long-term will reduce and maintain the concentration of contaminants, specifically in conjunction with the source control/reduction in the A-zone

groundwater.

Reduction of Toxicity, Mobility, or Volume through Treatment: This alternative does not include treatment, however, natural attenuation would reduce some volume and concentrations of the COCs. Integrity of the caps and their maintenance reduce contaminant mobility and slowdown the impact of the B-zone groundwater

Short-term Effectiveness: No active reduction in the B-zone groundwater contamination; short-term effectiveness of this action is minimal. Appreciable short-term results are not expected with this alternative alone.

Implementability: This alternative will not interfere with on-site remedial activities, and is implementable.

Costs: The selected remedy is cost effective.

State Acceptance: The DTSC has accepted this component of the selected remedy.

Community Acceptance: The community concerns regarding this component of the remedy have been addressed as discussed in Part 3 of this document.

Installation of a dewatering system in the A-zone aquifer with above-groundwater treatment and disposal

This alternative consists of dewatering in the A-zone, treating the removed water, and discharging the treated water to the Arvin City sewer. In this alternative, several large diameter wells will be installed at the optimum locations. The large diameter sump wells will be constructed by drilling 8-foot diameter holes at the select locations to a depth of 75 feet or to the base of the A-zone. It is expected that an average of 15 to 150 gallons per day would be extracted from the A-zone using this approach. The extracted water will be treated using an UV/Oxidation system in a plant located on-site. The treated water would be discharged to the Arvin City sewer. Alternatively, a service contract might be utilized for off-site treatment and disposal of the water if such an approach is found to be cost advantageous.

Long-term Effectiveness and Permanence:

Alternative 3, which removes contaminants from the A-zone groundwater, affords good long-term effectiveness for the treatment of COCs, although it is less effective on pesticides (dinoseb). This alternative is likely to be most effective in the extraction and treatment of the A-zone groundwater, and therefore reducing the source for additional A-zone and B-zone groundwater contamination, resulting in a relatively high level long-term effectiveness.

Reduction of Toxicity, Mobility, or Volume through Treatment:

Extraction and treatment of the A-zone soil vapors and groundwater actively reduce the toxicity, mobility, and volume of the contamination that is a principal source of contamination for the B-zone. Integrity of the RCRA and non-RCRA caps and their maintenance reduce contaminant mobility and "faster" impact of the B-zone groundwater.

Short-term Effectiveness:

Active dewatering of the contaminated A-zone reduces the source of contaminants to the B-zone. Short-

term effectiveness is directly related to the effectiveness of the process in the heterogeneous soil profile of the A-zone. Highest short-term effectiveness to reduce contaminant concentrations in the vadose zone of the A-zone.

Implementability:

The ease or difficulty of implementing the alternatives is assessed with respect to technical feasibility, administrative feasibility, and availability of services. This alternative addresses groundwater remediation using standard proven technologies that are implementable.

The technical feasibility of groundwater extraction and treatment is dependent upon the deliverability (quantity) of groundwater through the A-zone silty-sand and silt layers to the large diameter sump wells. Also, the effectiveness of this alternative to remove COCs is dependent on the quantity of water that can be removed with the process. Further site-specific information will be required during design to implement this alternative.

Costs: The selected remedy is cost effective.

State Acceptance: The DTSC has accepted this component of the selected remedy

Community Acceptance: The community has accepted this component of the selected remedy.

13.5 Preference for Treatment as a Principal Element

There is no remaining source material(s) posing a principal threat at the B&B Site and EPA's statutory preference for treatment of principal threats does not apply to this site (NCP §300.430(a)(l)(iii)(A)).

However, this remedy satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment) (NCP §300.430(f)(5)(ii)(F)). Treatment is a major component of the selected remedy for the groundwater. The COCs in the shallow A-zone groundwater are a potential threat to the deeper potential and current water aquifers and will be treated using source reduction in the A-zone. A relatively low concentration groundwater contaminant plume will use an extraction and treatment system with large diameter sump wells and an ultra violet/oxidation treatment system installed at the non-RCRA portion of the site for treatment and discharge of the treated water to the city sewer.

13.6 Five-Year Review Requirements

Because the remedial actions at the Site will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, and will take longer than five years to attain RAOs and cleanup levels, a statutory review will be conducted within five years of construction completion of the B&B Site remedial system to ensure that the remedy is, or will be, protective of human health and the environment.

14.0 Documentation of Significant Changes

The Proposed Plan for the B&B Site was released for public comment on June 21, 2007. The Proposed Plan identified combination of Alternative 2-Monitored Natural Attenuation of the groundwater in the A-zone and B-zone; Alternative 3-Installation of a dewatering system (extraction and treatment) in the A zone

with above groundwater treatment and disposal; along with, relocating the Arvin City Well No. 1 (CW-1) as a preferred remedy. The A-zone groundwater extraction and treatment was a component of the selected OU-1 remedy. Based on design studies and additional information collected during the remedial action phase of the project, the A-zone groundwater extraction and treatment was not installed but was carried forward to OU-2 to be addressed in conjunction with actions for the B-zone groundwater. Results of the aquifer test show a very low yield of water. The Proposed Plan did not specifically state that Alternative 3, consisting of the A-zone groundwater extraction and treatment was a carried forward task, and actions in the 1993 OU-1 ROD for A-zone groundwater were interim actions. Nevertheless, the A-zone groundwater extraction and treatment is considered and addressed in Alternative 3 in the second operable unit (OU-2). Therefore, this is not a significant change or difference from the Proposed Plan.

The Proposed Plan specified a cleanup level for 1,2,3-TCP at 40 µg/L in the B-zone groundwater, and cleanup goal range of 400 – 4,000 µg/L (10 to 100 times the B-zone groundwater cleanup level) in the A-zone groundwater. Since there is no MCL for 1,2,3-TCP, the source of this cleanup level was EPA's August 2006 chronic health-based level. However, the CDHS's Drinking Water Program has issued Drinking Water Notification Levels and Response Levels, which include a Response Level of 0.005µg/L for 1,2,3-TCP. Based on this information and available practical quantification limits for 1,2,3-TCP, EPA is specifying 0.5 µg/L cleanup level for 1,2,3-TCP in the B-zone groundwater and a range of 5 – 50 µg/L range for cleanup goal in the A-zone groundwater in this ROD. This change could affect the duration and cost of the MNA component of the remedy as projected in the fate and transport model. EPA still expects the remedy will be effective in a reasonable timeframe, and without substantial cost increase. However, as stated in Section 12.2, effectiveness of MNA will be evaluated, as detailed in the MNA performance plan.

EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

PART 3 RESPONSIVENESS SUMMARY

This section provides EPA's response to comments received on the Brown & Bryant (B&B) Site June 2007 OU-2 Proposed Plan. The Proposed Plan includes EPA's preferred/selected remedy, implementation of a combination of alternatives 2 (MNA for the B-zone groundwater) and Alternative 3 (Source reduction in the A-zone and No action in the B-zone), along with the relocation of the Arvin city well CW-1 to achieve the long-term goal of preventing potential future exposure to the public from contaminated groundwater. Public comment period was extended from 30 days (June 21, 2007 to July 21, 2007) to 67 days (June 21, 2007 to August 28, 2007). Two public meetings were conducted, June 21, 2007 and August 9, 2007, during the public comment period. In addition, several other meetings with City of Arvin officials, Arvin Community Service District (ACSD) representatives and Arvin Citizen Taskforce group were held during the comment period to discuss the Proposed Plan and information about the B&B Site. Transcripts of the public meetings are included in the Administrative Record. The public expressed several comments during the public meetings. Written comments were also submitted during the comment period.

Many of the comments were similar. These comments have been grouped according to their subject matter and summarized by a general comment that condenses the issues and concerns expressed in a number of specific comments. These general comments are transcribed in italic font. Many comments were raised or submitted to support larger general comments. The response summary provided in regular font below each general comment addresses these many detailed comments as a part of the response to the general comments.

1.0 RESPONSE TO COMMENTS AND CONCERNS RAISED DURING THE PUBLIC MEETINGS.

COMMENT #1

During the June 21, 2007 and August 9, 2007 Public Meetings, several people indicated that they are concerned about the water quality that they consume and potential health hazards and that the B&B Site has contaminated the City of Arvin municipal drinking water with contaminants of concern (COCs).

RESPONSE:

The closest down gradient well for the Arvin City water supply is Well CW-1. The water quality from this well has not been contaminated above Maximum Contaminant Limits (MCLs) by the B&B Site COCs as verified by the remedial investigation and routine sampling results provided in the Remedial Investigation/Feasibility Study (RI/FS) Report. However, COCs at levels below the MCLs have been detected in this well in the past. The well CW-1 is completed in the deeper C-zone aquifer, which is hydraulically separated by the thick Corcoran Clay layer from the impacted upper B-zone aquifer and the A-zone groundwater. In addition, the Arvin public water system operated by the Arvin Community Services District (ACSD) is regulated under EPA's Safe Drinking Water Act (SDWA) by the California Department of Health Services (CDHS). The ACSD routinely tests the City of Arvin municipal water supply and submits the results to CDHS to demonstrate compliance with the SDWA requirements, which includes compliance with the drinking water Maximum Contaminant Limits (MCLs). These testing results show that the water supply to the community meets all the drinking water MCLS as specified by the Safe Drinking Water Act and provides further verification that the water supply has not been contaminated by the B&B Site.

The Proposed Plan includes decommissioning and relocation of Arvin City Well CW-1 as a component of the preferred/selected remedy. The Well CW-1 is completed with the production screen set below the B-

zone and the Corcoran Clay layer, but the annular space of the well is reported to be gravel packed from 50 feet below ground surface to the total depth, which may act as a conduit for future cross contamination to C-zone aquifer if the B-zone is impacted in that area in the future. Therefore, properly plugging and abandoning the Well CW-1 eliminates the potential health risk pathway for exposure to the B&B Site COCs. The preferred/selected remedy includes institutional controls consisting of limiting access to impacted groundwater in the B-zone to prevent exposure, and to restrict the completion of any wells near the B&B site to prevent any cross contamination. Finally, these measures also restrict the operation of supply wells near the B&B Site, which serves to reduce pumping influences that may cause the spread of groundwater contamination and, thereby, supports the implementation of the Monitored Natural Attenuation (MNA) remedy for the B Zone groundwater.

COMMENT #2

During the June 21, 2007 Public Meeting, several people indicated that the existing tank and structures at the Site are contaminated and EPA has not taken any action during the past 15 – 20 years to address contaminated structures and groundwater contamination. Several individuals also commented that EPA has not adequately notified the public of Site remedial activities.

RESPONSE:

From 1983 through 1988, the B&B Facility conducted several soil and groundwater investigations and remedial actions under California Department of Health Services supervision. In 1989, the B&B Facility ceased operations. In 1989, the site was listed on the National Priorities List (NPL) by EPA. After the B&B site was listed on the NPL, various emergency and removal actions were initiated, including the original source area of contamination (facility waste pond, tanks, sump area and the dinoseb spill area). Approximately 268,000 gallons of liquid and 12,000 gallons of sludge were removed from the Tank UN-32 (existing tank). The interior of the tank was triple rinsed and washed with high pressure water after removal of the sludge. Confirmatory wipe samples indicate that the tank is clean. EPA is in process of removing this tank from the Site. The actions also included contaminated surface soil removal and disposal, subsurface soil and groundwater investigations, as discussed in the OU-2 RI/FS Report, to minimize or eliminate immediate threats to human health and the environment as a part of OU-1. EPA completed an extensive OU-2 RI/FS to address groundwater contamination at the Site. Investigation of soil vapor and groundwater has been completed at the B&B site.

Since 1988, EPA has provided notifications and held public meetings, including public notices, availability of the administrative record, community meetings, fact sheets, community interviews, community relation plans and public notices in local news papers in English and Spanish for the ongoing actions at the Site. The Site Administrative Record, which includes the RI/FS Reports, the Proposed Plan, and other site related technical documents, is made available at the Site information repository at the local library in Arvin, California. Contact information for the EPA Remedial Project Manager (RPM) is posted at the Site. This number is manned during regular business hours and an answering machine with a greeting in English and Spanish is available to take messages after business hours. EPA policy is to return calls on all messages with a callback number within two business days.

COMMENT #3

During the June 21st Public Meeting, an individual handed a petition to the EPA RPM, which included the following five demands:

1. *EPA develop a new proposed plan to clean Arvin's groundwater with assistance and oversight by a citizen group,*

2. *The new proposed plan cleans all affected groundwater and remove contaminated soil from the Site,*
3. *EPA translate all Brown & Bryant documents and materials to Spanish before taking further action,*
4. *EPA pays for independent water quality testing of Arvin's groundwater, and*
5. *EPA insures that new replacement wells are constructed and operational before closing any municipal wells. We all deserve clean water.*

RESPONSE

1. EPA's Proposed Plan has been developed following closely the National Contingency Plan (NCP), and other Federal and State regulations. The Proposed Plan is based on the extensive RI/FS performed for the Site, which evaluated all available technologies for remediation at the Site. The Proposed Plan presents all of the remedial alternatives that were developed in the FS Report based on site-specific RI findings and technology evaluation. EPA believes that a new or revised Proposed Plan would not add any new alternatives that have not already been examined in the FS and the Proposed Plan. EPA did extend the public comment period to allow more input from the public. EPA has encouraged public and community involvement and participation, including public hearings and meetings, meetings with Arvin Community Service District, meetings with Arvin City Officials, meetings with Community Taskforce, informational presentations and question and answer sessions, and accepted comments during the comment period to incorporate public and community input and concern for the remedy selection.

2. Remedial alternatives in the June 2007 Proposed Plan include and consider remediation of all affected groundwater at the Site. The preferred remedy in the Proposed Plan includes extraction and treatment of impacted groundwater in the A-zone, which is the source of contamination to the B-zone groundwater. The preferred remedy also includes monitored natural attenuation for remediating the impacted B-zone groundwater. The C-zone groundwater is not impacted by the Site COCs above the MCLs. The preferred remedy includes decommissioning and relocating the existing Arvin City well CW-1 in order to prevent any future potential exposure to the Site COCs. The contaminated surface soil was removed and disposed off site as a part of OU-1 remedial actions. The NCP and other Federal regulation require any proposed remedial action to be protective of the public health and the environment. The preferred remedial action, Alternative 2 and 3, will meet both objectives and ranks the highest overall among other alternatives.

3. EPA agreed to translate pertinent selected documents to Spanish, following consultation with the Community Taskforce as time permits, which are necessary to facilitate public comprehension and participation.

4. EPA paying for independent quality testing of groundwater is not relevant to the Proposed Plan and remedy selection. EPA uses independent contractors, and the contractors utilize independent nationally accredited laboratories for testing during remedial investigation work. ASCD utilizes separate independent nationally accredited laboratories for testing the water supply as required by CDHS.

5. The preferred/selected remedy includes replacement of Arvin City Well CW-1. Since the Arvin City Well CW-1 is not contaminated above MCLs, EPA plans to construct a replacement well first, and then decommission and properly abandon the Well CW-1.

COMMENT #4

During the August 9, 2007 Public Meeting, 72 people verbally commented on the Proposed Plan for the B&B Site. Most of the comments were similar and are generally grouped into four categories: concern about the public water supply being contaminated by the Site COCs, health hazards associated with contamination, socioeconomic concerns, and demanding full cleanup of the Site.

Commentors expressed that their drinking water is not clean and they deserve clean water. They state that they are paying monthly fees for contaminated water and they want EPA to pay for half or part of the water bill. One commentor stated that the water appears white or murky sometime. One commentor indicated that filters are needed for safe water. Commentors asked the public to unite, and stand up for their right to clean water. One commentor stated that she lived here since 1983 and they test water here in Arvin for more standards than bottled water, the water supply is not contaminated, that the Community should come together and help EPA, that the people who have proposed the cleanup are engineers and have studied the Site, and that it is better to have faith and appreciate EPA doing something to bring a solution to the Site.

Several commentors indicated that kids and adults are sick and can get sick from the Site and that the EPA needs to take action before someone dies.

Commentors demanded environmental justice and indicated that there is discrimination against the Latino population and poor people and they expect respect and urgency from the EPA. Some commentors stated that they are in fear of losing their homes, as their homes are now worthless due to the water contamination. Commentors stated EPA is not listening to their concerns and that EPA is not doing its job. They state that EPA is telling them that it will take 5, 10, 15 and 20 years to clean up and they demand total cleanup of the Site. They want EPA to clean up the Site right, for EPA to do the best job, and hope that EPA does not take their comments and forget about them. A petition signed by many people was received which asks EPA to protect people from the B&B Site and select Alternative 6 for the groundwater cleanup. One individual showed concern with all remedial alternatives; one commented that nothing has been done at the Site for 25 years; one indicated that EPA studies do not suggest Alternative 3 as the preferred remedy, and if no improvement is made after a certain period, then Alternative 6 should be implemented. One commentor stated that contamination at the Site is a big and serious problem and needs a big and serious solution.

RESPONSE:

As discussed in response to Comment #1, the Arvin City water well CW-1 is not contaminated above MCLs by the B&B Site COCs as verified by the remedial investigation and routine sampling results provided in the RI/FS Report. The ACSD routinely tests the City of Arvin municipal water supply to demonstrate compliance with the SDWA requirements, which includes compliance with the drinking water standards. These testing results show that the water supply to the community meets all the drinking water standards as specified by the SDWA. As for the water appearing to be murky or white, during the June 21, 2007 Public Meeting, the ASCD water district manager explained that sometimes an appearance of murkiness or white is due to aeration in water associated with pumping, which may not be from the Well CW-1 since the ASCD draws water from several wells in the area. EPA agrees with the public right for safe drinking water, as provided in the SDWA. EPA addresses environmental contamination for protection of human health and the environment. Questions regarding monthly water bills in the City of Arvin should be addressed to ASCD. It is true that Arvin City water supply is tested for more drinking water contaminants, under the SDWA, than bottled water. EPA is attempting to address the contamination at the B&B Site based on extensive remedial investigations conducted at the Site. EPA believes that no individual has been exposed to the Site contaminated groundwater, and EPA intends to take necessary actions to assure that no

individual is exposed in the future.

EPA performs necessary remedial investigation and cleanup based on the need to protect human health and the environment, without any racial or socioeconomic discrimination. EPA is always willing to listen to public concerns, as demonstrated by community involvement incorporated for Superfund sites. As discussed in response to previous comments, EPA conducted numerous meetings with the community regarding the Proposed Plan for the B&B Site OU-2 to address public and community concerns based on Site information. EPA will consider comments provided by the community during the remedy selection. As addressed in response to Comment #2, EPA implemented several emergency and removal actions to reduce and control contamination at the Site. It is EPA's intent to address the contamination issue at the B&B Site appropriately to protect human health and the environment. Until the Site is remediated appropriately to provide permanent and long-term protection, EPA will implement necessary controls and measures to assure that no individual is exposed to Site COCs that pose health hazards.

Remedial alternatives developed during the FS are based on extensive remedial investigations of the soil and groundwater conducted at and around the Site. The FS indicates that the combination of Alternatives 2 and 3, along with appropriate abandonment and relocation of City Well CW-1, is the appropriate preferred remedy, which is expected to meet the remedial action objectives. Alternative 6 is not an appropriate remedy for the B&B Site OU-2, as discussed in detail in response to Comment #6. As required by regulation, EPA conducts periodic reviews every five years as long as the remedial action objectives are not attained to assure that the remedy is protective of human health and the environment. The five-year review also evaluates whether the selected remedy is remediating the Site at the expected rate. If any review shows that the implemented remedy will not achieve the objectives, EPA will initiate necessary contingencies, modify the remedy, or replace the remedy to assure continued protection of human health and the environment.

COMMENT #5

During the August 20, 2007 Meeting with the Arvin Community Task Force, a large number of written comments/petition from the residents of the City of Arvin were handed to the EPA representative. All of these comments were similar typed form format with date, name and signature filled in. The comments demanded that EPA act immediately with a total clean up without compromising anyone's health. The comments also demanded that EPA select Alternative 6 or better, and EPA has to guarantee that the water and the soil in the A-zone and the B-zone are completely free of chemicals.

RESPONSE:

EPA is acting as expeditiously as possible under the CERCLA process to implement the preferred remedy to clean up the B&B Site. As discussed in response to comment #2, since 1989, EPA has conducted investigations, source removal, remedial actions and feasibility studies, which are necessary steps to appropriately clean up the Site so that it does not pose a hazard to human health or the environment. EPA will not compromise human health and the environment at this site or any other site. Selection of Alternative 6 is discussed in response to Comment #6 below. EPA is required to conduct periodic reviews every five years as long as the remedial action objectives are not attained to assure that the remedy is protective of human health and the environment. The five-year review also evaluates whether the selected remedy is remediating the Site at the expected rate. If any review shows that the implemented remedy will not achieve the objectives, EPA will initiate all necessary actions, including modifying or selecting a new remedy to assure continued protection of human health and the environment.

2.0 RESPONSE TO WRITTEN COMMENTS SUBMITTED DURING THE COMMENT PERIOD

COMMENT #6

The ACSD submitted written comment for EPA to select Alternative 6 – Groundwater and vapor extraction and treatment in the A-zone and the B-zone to clean up the groundwater instead of the EPA's preferred/selected remedy. The ACSD also supported decommissioning and relocation of the Arvin City Well CW-1. Honorable Senator Dean Florez of the California State Senate submitted a written correspondence on July 15, 2007 to EPA supporting EPA's effort in removing all contamination left behind at the B&B Site, and urging serious consideration for selecting Alternative 6. Two community members submitted written comments requesting selection of Alternative 6 as the remedy of the Site OU-2. A petition with over 35 signatures was submitted insisting that EPA select Alternative 6 or another cleanup plan that will remove contamination from all affected groundwater and ensure that no future contamination occurs.

All of the above comments are similar to the fact that they prefer EPA select Alternative 6 as a part of the remedy for the B&B Site.

RESPONSE:

All of the seven alternatives discussed in the Proposed Plan were evaluated against nine evaluation criteria developed by EPA to address CERCLA statutory requirements. These criteria and an evaluation summary table are presented in the OU-2 Feasibility Study Report and in the Proposed Plan. Alternatives 2 and 3, components of EPA's preferred/selected remedy, jointly rank higher and comply with more evaluation criteria than Alternative 6. EPA believes that the preferred/selected remedy will attain the remedial action objectives within a reasonable timeframe and will be protective of human health and the environment. Implementability of Alternative 6 is highly questionable, as drilling of extraction wells in the A-zone through the RCRA cap will require a variance from the OU-1 remedy. Alternative 6 will also require additional pilot testing to verify effectiveness of multi-phase extraction. The lithology of the site is such that that the vapor extraction system for the A-zone is unlikely to be effective, the production rate and the saturation thickness of the A-zone zone will not support a long-term pump and treatment system.

Alternative 6 also includes installation of 75 wells in the B-zone using a conventional pump and treat approach to remediate the B-zone groundwater. This will require installing an extensive number of groundwater extraction wells off-site, away from the onsite areas with elevated concentrations in the B-zone. Pumping groundwater off-site could be detrimental as the pumping influences could cause the spread of contamination. Extensive pumping from the semi-confined B-zone aquifer could also increase the vertical migration of the impacted A-zone groundwater to the B-zone. The time frame for remediation of the B-zone could be similar to that of an MNA remedy. Pump and treatment of the B-zone groundwater, as described in Alternative 6, prior to removing or controlling the source of contamination in the A-zone groundwater could be counter productive.

EPA believes that it is prudent to eliminate or control the COCs in A-zone groundwater, source of contamination to the B-zone groundwater first without adversely impacting the B-zone groundwater, and allow natural attenuation processes to remediate groundwater in the B-zone. Thus, the MNA for B Zone groundwater can be implemented at the same time as the A zone groundwater remedy. The groundwater fate and transport model for the Site indicates that once the vertical migration of A-zone impacted groundwater is eliminated or controlled, the natural attenuation process is expected reduce the COC groundwater concentrations to the cleanup levels within a reasonable timeframe. Concentrations of COCs in the groundwater will be verified by periodic monitoring and evaluation in accordance with MNA

guidelines and MNA performance Plan. After the A zone remedy is completed, the progress and effectiveness of MNA in the B Zone will continue to be reviewed and evaluated. If monitoring data indicate that the COC levels do not continue to decline, as estimated in the fate and transport model, EPA and DTSC will reconsider the remedy decision. If Alternative 6 is implemented, the A and B-zone groundwater will not likely attain MCLs any faster than the preferred remedy. Furthermore, if pump and treatment of the B zone is implemented prior to completion of the A-zone remedy, it is believed that the Alternative 6 remedy could fail.

There is no current risk to the public and environment from the site. Institutional controls, such as deed and zoning restrictions, will be placed on-site and off-site. Active groundwater extraction and treatment of the B-zone will not be necessary if the remediation of A-zone stops migration of COCs from the A zone to B zone. The groundwater model shows that if the A-zone is remediated, the COC concentrations in the groundwater are not likely to exceed their respective MCLs. The goal of remediation is to reduce the levels of COCs in the B-zone groundwater to the MCLs. In addition, Alternative 6 has an estimated cost of $70,489,000, compared to the estimated cost of $15,585,000 for the preferred/selected remedy in the Proposed Plan. Thus, alternative 6 also fails the cost effectiveness criteria as its cost is about 4.5 times that of the preferred/selected remedy and without providing any significant increase in effectiveness. Alternative 6 also does not satisfy the short-term effectiveness criteria. The preferred/selected remedy also includes decommissioning and relocation of the Arvin City Well CW-1, which is the only known potential pathway to the C-zone groundwater. Abandonment and relocation of the City Well CW-1 will eliminate any future potential risk to human health. Therefore, the preferred/selected remedy, Alternatives 2 and 3, is appropriate to address the remedial action objectives for the B&B Site.

COMMENT #7

This comment summarizes written comments received from four citizens of the Arvin community.

One commentor demanded full cleanup of the Site, and showed concern that there is a possibility that the water supply system will be contaminated and will be unhealthy if not cleaned up properly in a timely manner. Comments also demanded action from EPA to provide clean air and water for residents, and indicated that discrimination seems to be in effect against the Arvin community. The commentor stated that there is a big problem with the water that is contaminated and to what degree, and the need to urgently address the issue now that all the inhabitants are at great risk of being poisoned. The commentor showed concern that the individual and their family members bought houses in Arvin because they thought that it was best decision, but now it is heard that the City of Arvin has the most contaminated air in the nation and the water is at risk of being contaminated, and they are worried and alarmed. The commentor also indicated that the houses in Arvin are no longer selling and if the inevitable problem of contaminated water is not fixed, the situation will be very grave, and asked EPA to fix this problem. One of the commentors states that when the individual's family decided to live in the Arvin it was because it had the best water in the region, and it was a quiet City, but things have changed and now the water is dangerously contaminated.

RESPONSE:

EPA intends to implement a full cleanup of the Site so it does not create any risk to human health or the environment. EPA's preferred/selected remedy includes decommissioning and relocation of the city water well CW-1, to assure that the water supply system is not contaminated. The city water supply is regulated under the Safe Drinking Water Act, as enforced by CDHS, and is routinely monitored to assure the supplied water is safe for drinking.

Monitoring of the City Well CW-1 as a part of the Site remedial investigations, and by the ACSD indicate that the city water supply is not contaminated above the MCLs, and the selected remedy will assure that the city water supply is not contaminated in future. The ACSD has been testing the city's water supply since the Safe Drinking Water Act was put in effect in 1974.

Any air contamination within the City of Arvin is not attributed to the B&B Site. The air quality that has been reported in Arvin is not a result of any of the B&B Site historical or current practices. The preferred/selected remedy for the B&B Site addresses risk of future contamination to the current or potential drinking water supply.

COMMENT #8

Honorable Mayor Tim Tarver of City of Arvin submitted a written correspondence on August 16, 2007 on EPA's effort to relocate City Well CW-1, and urged EPA to take this action immediately. Also, Arvin Community Service District (ASCD) submitted a correspondence dated August 27, 2007 supporting EPA's effort to move City Well CW-1. ASCD also indicated that Replacing Well CW-1 as soon as possible would be the most acceptable option to the City and the general public, and that ASCD will continue to test CW-1 for contaminants as long as needed to help in those efforts and to help ensure the safety of the Arvin residents.

RESPONSE:

EPA, along with City of Arvin and its citizens, is concerned that the City Well CW-1 is at risk of being contaminated by the B&B Site COCs. Therefore, EPA included decommissioning and relocation of the City Well CW-1 in the preferred/selected remedy, and appreciates the concern and support from the City of Arvin. EPA intends to take this action as soon as possible before it creates any risk to human health or the environment.

COMMENT #9

Center on Race, Poverty & the Environment (CRPE) submitted written comments on August 27, 2007 regarding the B&B Site Proposed Plan. Comments and response are presented below:

The Center on Race, Poverty & the Environment ("CRPE") submits these comments to the Environmental Protection Agency, Region 9 ("EPA") on the Brown & Bryant Superfund Site Proposed Plan on behalf of itself and the Committee for a Better Arvin ("CBA"), formally known as the Brown & Bryant Clean-Up Committee. We request that EPA adopt a combination of Alternative 3 and Alternative 5; institute performance standards which, if not met, will trigger additional remedial action to decontaminate groundwater; remediate A and B-Zone contaminated soils; transmit all future monitoring results from the monitoring wells and city well #1 to CBA; immediately install a new drinking water well to replace city well #1; install additional monitoring wells around city well #1 to better track the movement of the contamination; and provide for continuing collaboration with CBA. Moreover, CRPE and CBA submit further comments on EPA's community involvement failures and substantive problems with the Proposed Plan and the remedial process.

Comment #9.1. Preferred Remedial Action

The Brown & Bryant site was added to the Superfund National Priorities List in 1989. Initially, EPA pledged to clean the surface soils and the A-Zone groundwater to ensure that the contamination would not migrate to the B-Zone waters.[1] However, EPA's attempts to implement its chosen remedy ultimately failed.

The EPA has taken an additional 14 years to finally develop alternatives to address the groundwater contamination. This long inaction has caused chemicals of concern ("COCs") to migrate into the B-Zone groundwater and put Arvin' s drinking water at risk. Despite contributing to the migration of COC's into the B-Zone, EPA now proposes to clean the A-Zone only. CRPE and CBA encourages EPA to acknowledge its contribution to the B-Zone contamination and take responsibility for the decontamination of the B-Zone by adopting the following measures

RESPONSE:

EPA is committed to assure that the soils and groundwater at the B&B Site does not pose a threat to human health and the environment. The short-term risks to human health and the environment were addressed first in the RI/FS for OU-1. The goal of the remedial action for OU-1 was to prevent exposure to soil contaminated above health-based levels and to control the source of contamination to the B-zone groundwater. COCs migrated into the B-Zone groundwater prior to 1989 when the Site was being placed on the National Priorities List. OU-1 included remedy components to curtail the migration of COCs from the A-zone to the B-zone such as installation of the non-RCRA cap to slow surface water infiltration and associated contaminant migration. Also, further treatment of A-zone contaminated groundwater was carried over to OU-2 because additional investigation was necessary to appropriately address the Site's overall groundwater contamination. The OU-2 proposed plan addresses B-zone groundwater by MNA along with treatment of A-zone groundwater to reduce the source of contamination.

Comment #9.1a. Alternatives 3 and 5

The majority of residents in Arvin have demanded a full clean up of the site at public hearings, through petitions, and in signed letters. The EPA's Alternative 6 is the only option which proposes treatment for both contaminated zones of groundwater. Initially, this was the option supported by the majority of the community and the various community groups. Because EPA has long insisted that a traditional pump and treat method is not feasible to decontaminate the A-zone groundwater due to low water yield, and because these contentions are supported by test results stemming from the 1993 Record of Decision ("ROD"), we are not confident that Alternative 6 will adequately clean A-Zone groundwater. However, we support a combination of Alternative 3 and Alternative 5 because together they are feasible, they will directly remediate contamination in both impacted zones of groundwater, they will reduce contamination more expediently than any of the other options, and they will be the most protective of human health. We also may support other options that will directly treat both zones of impacted groundwater. Because EPA's Alternatives 1 through 5, standing alone, do not remediate both contaminated zones, we oppose each of those alternatives.

RESPONSE:

Alternative 5, which consists of extensive pump and treat in the B-zone groundwater, is also a component of Alternative 6. EPA believes Alternative 5 is not appropriate for the same reason as explained in response to Comment #6 for implementing Alternative 6. Based on data collected during the RI, Alternative 2, MNA, is appropriate for the B-zone groundwater based on site data. Alternative 2 and 3 will effectively treat groundwater in the B-zone. These Alternatives include monitoring, review, and contingency measures that will be implemented to ensure that the selected remedy for the B-Zone is effective.

Comment #9.1b. Performance Standards

CRPE and CBA request that concrete and well-defined performance standards be developed as part of the ROD to measure the success of the selected alternative. If the performance standards are not being met

according to monthly monitoring results, then EPA must immediately implement additional treatments to ensure that the performance standards are being met in both impacted zones. EPA, CBA, and city officials should work together to come up with these performance standards. These performance standards should be based on reducing toxic contamination to levels below MCLs within three years.

RESPONSE:

The ROD includes performance standards, as specified in the Proposed Plan. The cleanup levels, which are the drinking water MCLs established for human health and the environment, are the performance standards for the selected remedy. Performance standards for the B-zone groundwater are the MCLs (Table 2 of the Proposed Plan), as it is classified as a potential drinking water source. The performance standards for the A-zone groundwater (Table 1 of the Proposed Plan), which are 10 to 100 times MCLs range were determined based on modeling of migration of A-zone groundwater to the B-zone to assure that A-zone groundwater is no longer a source of contamination to the B-zone groundwater. Definitive cleanup levels for the A-zone groundwater will be established within the range based on additional data obtained following operation of the A-zone groundwater treatment system. EPA is required to conduct periodic reviews every five years as long as the remedial action objectives are not attained to ensure that the remedy is protective of human health and the environment. The five-year review also evaluates whether the selected remedy is remediating the Site at the expected rate. If any review shows that the implemented remedy will not achieve the objectives, EPA will initiate necessary contingencies, modify the remedy, or replace the remedy to assure continued protection of human health and the environment. Time frames required to meet the performance standards are difficult to assess in advance of implementation. Based on the information developed in the RI/FS and groundwater remediation experience from similar sites, EPA believes that there is no remedy that can attain performance standards in three years. Furthermore, attempts to accelerate attainment of performance standards in all zones would be counter productive as discussed in the response to comment 5.

Comment #9.1c. Soil Treatment

The toxic contamination from the Brown & Bryant operation has infiltrated the surface soils, A-Zone soils, A-Zone groundwater, B-Zone soils, and B-Zone groundwater. The ROD for OU- 1 addressed the surface soils and A-Zone groundwater only. Most of the contaminated surface soil remained on-site, covered with a RCRA cap. The rest was removed off-site to Shafter and other regional disposal facilities. Soil more than seven feet beneath the surface and soil between the A-Zone and B-Zone groundwater has not been treated and remains contaminated. These soils are not part of OU-1 or OU-2, but will have a continuing impact on the groundwater. There are no plans to remediate these sub-surface soils in the future. Because the success of any treatment of the groundwater will be limited if the COCs remain in the soil, the ROD for OU-2 should address this important issue. The only way to fully decontaminate the subsurface soils is to remove them from the site. The Proposed Plan for OU-1 also included several alternatives with soil vapor extraction or soil washing to treat subjacent soils, which the EPA should reconsider.

EPA's arguments that the RCRA cap will protect the groundwater from COCs in the soils fails for three reasons. First, the RCRA cap only covers a portion of the site, even though chemical spills occurred throughout the entire area. The asphalt cap covering the remaining portion is not built to any specific standard that would ensure that seepage will not enter the subjacent soils. Second, the RCRA cap, though built only seven years ago, is already showing signs of disrepair, including cracks and rodent holes.[4] Finally, groundwater in the two zones has shown increased chemical concentrations after the RCRA cap was installed.[5] This is verifiable evidence that the cap is not fully preventing chemicals from the soil from migrating to the groundwater. Until this vital pathway is addressed, the Brown & Bryant site will continue to pose a significant risk to the public.

RESPONSE:

EPA's preferred/selected remedy will remediate the A and B-zone groundwater and associated subsurface soils. Extraction of groundwater from the A-zone will also extract COCs from the A-zone subsurface soils. MNA in the B-zone groundwater is also expected to reduce the COCs in the B-zone subsurface soils. The OU-1 actions addressed the impacted surface soils by removal and off-site disposal, and stabilized the remainder of the soils on-site with RCRA cap for groundwater protection. The OU-1 remedy specifies maintenance of the RCRA and non-RCRA caps so that they are effective in preventing direct exposure and protecting the groundwater by preventing infiltration. The OU-1 Operation and Maintenance (O&M) includes routine inspections of the caps to identify needed repairs and maintenance. Prior to the installation of the caps, increased COC concentration in the B-zone groundwater was from percolation of the impacted A-zone groundwater. The rate of increase of COCs in the B-zone has reduced following the installation of the RCRA cap. The preferred/selected remedy addresses the COC impacted A-zone groundwater so that it is no longer a source of contamination to the B-zone groundwater, which is the point of compliance. The RCRA and non-RCRA caps are currently scheduled to be repaired in the Fall 2007.

Comment #9.1d. Monitoring Results

The EPA has placed monitoring wells on and adjacent to the Superfund site. The EPA has monitored these wells on a monthly basis for the last three years and on a quarterly basis before that. The EPA should continue its groundwater monitoring for the foreseeable future. These monitoring reports should be transmitted to CBA to ensure that the community is kept informed about the rate of contamination, the risk to human health, and whether or not remedial measures have been effective. Congress made public involvement in decision-making an important part of the Superfund process. Congress wanted to ensure that the people whose lives were affected by abandoned hazardous waste sites would have a say in actions to clean them up. The best way to live up to this goal is to ensure that the public has access to the most up-to-date information about their site and the risk that it poses.

RESPONSE:

EPA will continue groundwater monitoring until data shows that the Site is no longer a threat to human health or the environment and the COCs are below MCLs. EPA maintains monitoring reports in the Site administrative record file, and the reports are available for review. EPA will also provide monitoring results upon request, or notify the appropriate authority if the results show any threat to human health or the environment. The groundwater monitoring results are also provided to CDHS.

Comment #9.1e. New Drinking Water Well

CRPE and CBA request that a new drinking water well be installed immediately. Because city well #1 is at risk, because there is some uncertainty as to the rate of contamination toward city well #1, and because EPA's historically slow response time at the site, the ROD should contain a definite time line for the complete installation of a new well which should be no longer than months. City well # 1 should not be closed prior to a new well being operational, unless it poses an imminent health risk.

RESPONSE:

EPA's preferred/selected remedy includes replacement of Arvin City Well CW-1. EPA will install a replacement well that meets ASCD requirements for water production and the quality of the water meets Safe Drinking Water Act and State of California requirements prior to decommissioning and abandoning the existing City Well CW-1.

Comment #9.1f. Additional Monitoring Wells

The EPA should install additional monitoring wells closer to and adjacent to city well # 1 to better track the toxic plume and to ensure that contamination does not reach the site unexpectedly. The majority of the monitoring wells are on-site and directly off-site. However, since the toxic plume has migrated so far off-site, additional wells should be installed to protect city well # 1 until that well is taken offline.

RESPONSE:

EPA will install new monitoring wells for tracking and additional investigation of the B-zone groundwater plume as a part of the remedy implementation. EPA will continue groundwater monitoring until data shows that the Site is no longer a threat to human health or the environment.

Comment #9.1g. Continuing Collaboration

CBA requests to continue its involvement in the remedial process. In addition to receiving the monthly monitoring results, CBA would like to be consulted as to all EPA's or EPA contractor's activities at the site. CBA requests to provide input for all future review documents. CBA will continue to educate the public on EPA's activities on the site and the effectiveness of the chosen remedy.

RESPONSE:

All groundwater monitoring results will continue to be provided to the public through the Administrative Record at the local library. The public is welcome to review these documents and comment on them at any time. In addition, the public may contact the EPA Remedial Project Manager or Community Involvement Coordinator for the project with their concerns. The contact number, 1-800-231-3075, is staffed during regular business hours and an answering machine with an English and Spanish greeting is available to leave messages after business hours; all calls are returned within two business days.

Comment #9.2. Substantive Issues with Proposed Plan

The EPA originally set out in 1993 to remediate the site before the COCs in the A-Zone groundwater reached the B-Zone. However, after some technical difficulties, the EPA deferred cleaning the A-Zone. Now, 14 years later, the EPA has finally developed plans to clean the groundwater. Because of EPA's inaction, the B-Zone groundwater has, in fact, become contaminated as speculated in the initial ROD. EPA's inaction is not the only defect in EPA's clean-up process. The EPA also has disseminated inaccurate and misleading material; has performed an inadequate risk-assessment; and failed to address many issues identified in the project's other documents.

RESPONSE:

The OU-1 RI data indicate that the COC impacted A-zone groundwater had already percolated into the B-zone prior to the 1993 ROD finalizing. The OU-1 remedy included components to curtail the migration of COCs from the A-zone to the B-zone such as the installation of the non-RCRA cap. However, further treatment of A-zone contaminated groundwater was carried over to OU-2 because additional investigation was necessary to effectively address the overall groundwater contamination of the B&B Site. The OU-1 remedy focused on the surface and near surface contamination sources, such as surface soils, tanks, sump, and ponds that required a prompt response to stem further contamination of groundwater and prevent any direct exposure to human health and the environment.

Comment #9.2.a. Misleading Material

Various data provided to the public in the Proposed Plan, as well as statements from EPA staff, have been misleading and inaccurate. The public has a right to know the full extent of the contamination and the risks it presents to nearby residents. This right has been violated because the EPA has provided the public with a mislabeled and misleading map, has withheld information about the extent of contamination in city well #1, and has misrepresented its own feasibility findings.

Figure 4 on page 6 of the Proposed Plan is titled "Extent of COC's in A-Zone and B-Zone Aquifers." The map shows two shaded areas of contamination which extend about 400 feet south of the site and several thousand feet from city well #1. However, this map does not match technical maps provided in the RI/FS, which show the contamination plume approaching city well #1 within several hundred feet. When I asked staff about the discrepancy between the maps, they informed me that the map provided to the public in the Proposed Plan was mislabeled and that it depicted the extent of dinoseb only. This was the only map available to residents.[9] The EPA did not clarify the mistake to the public or to Arvin city officials without considerable prompting. Mistakes such as this calls into question the true motivation of the EPA. By attempting to minimize the appearance of a threat to the public, the EPA severely limits the ability of the public to meaningfully participate in finding a solution.

The EPA has repeatedly and publicly stated that no COC has ever been found in city well #1. The RI/FS explains that a COC has been found in city well #1 on three different occasions. When confronted with that fact, the EPA is quick to point out that the dinoseb finding was ruled to be laboratory error. However, the EPA is unable to explain the two other instances of contamination. The EPA has not provided any evidence that the two positive results for the COCs resulted from anything other than the Brown & Bryant site. Again, by attempting to minimize the appearance of a public threat, the EPA does a great disservice to the residents of Arvin and effectively limits meaningful participation.

Finally, the EPA misstates its own feasibility study findings in its Proposed Plan. In Table 3 on page 11, the EPA compares each alternative's ability to meet certain evaluation criteria. The EPA rates each criteria as 1) fully meeting criteria, 2) partially meeting criteria, and 3) not meeting criteria. The comparison tends to demonstrate that alternative 3 and alternative 6 mostly meet the evaluation criteria. Alterative 6, while scoring top marks in just about every category, is designated as failing to meet the criteria for short-term effectiveness. However, according to the feasibility study, Alternative 6 was rated as having the best short-term effectiveness of all the alternatives.[10] In fact, Alternative 3 received one of the worst marks for short term effectiveness in the feasibility study, despite being the only alternative in the Proposed Plan that received a passing mark. EPA staff was unwilling or unable to explain this discrepancy. Without knowing the true motivations of EPA, it appears that the agency is attempting to bolster its chosen alternative in those documents available to the public. Because the RI/FS is not readily available to the public, the residents of Arvin rely on the EPA to report its findings accurately. The EPA has severely damaged its credibility by misreporting its own findings. Again, this type of misstatement is detrimental to informed public participation.

RESPONSE:

EPA agrees that the public has right to know the full extent of the contamination and the risks it presents to the public. EPA does not believe this right has been violated as EPA intended to provide correct information in the Proposed Plan that would be adequate to comprehend the Site issues and concerns. It is not practical to include all technical data collected during the RI in the Proposed Plan. EPA has always made available all of the detailed technical data collected during the RI at the local Site information repository.

Figure 4 of the Proposed Plan is intended to show a general summary of approximate extent of contamination at the Site. The text on Page 5 of the Proposed Plan describes Figure 4 as it depicts estimated extent of dinoseb, dibromochloropropane and 1,2-DCP. The plume legends indicate approximate extent of COCs in the Aquifers. There are eleven figures (technical maps) showing extent of contamination in A-zone and B-zone groundwater for seven COCs for the Site. Figure 13F and 14E of the RI Report for extent of dinoseb in groundwater were used to present a summary figure in the Proposed Plan. Dinoseb was selected for general summary, as it has been a primary concern of Site contamination. The extent of contamination above the MCLs in the B-zone groundwater for the other two mentioned COCs (dibromochloropropane and 1,2-DCP) are fairly similar to the dinoseb. Figure 4 of the Proposed Plan does not match the technical map indicated in the comment (Figure 14A of the RI Report for 1,2-DCP for B-zone groundwater). The depicted plume in Figure 14A includes all detection for 1,2-DCP, including below the MCLs. 1,2-DCP concentrations in wells WB2-3, PWB-8 and PWB-5, beyond well PWB-7 are below MCLs. The extent of 1,2-DCP above the MCL and requiring remedial action is near well PWB-7, similar to the dinoseb. Therefore Figure 4 of the Proposed Plan presents an accurate summary of the approximate extent of contamination in aquifers necessary for a proposed plan.

EPA maintains that the City Well CW-1 is not contaminated by the Site above the MCLs. COCs were detected at low levels in several sampling rounds, significantly below the MCLs. Following the data validation, which includes review of any sampling and laboratory errors, estimating values below the analytical detection limits, review of compliance with Quality Assurance/Quality Control (QA/QC) protocols, and frequency of detection versus non-detection in subsequent sampling events has indicated that the CW-1 is not contaminated by the Site COCs above the MCLs.

Table 3 of the Proposed Plan is prepared to summarize evaluation of criteria for the alternatives. In Table 3 of the Proposed Plan, Alternative 6 is designated to have poor marks for the short-term effectiveness. The short-term effectiveness is evaluated based on any adverse impact that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved. Alternative 6, consisting of significantly more and complex remedial construction, consisting of drilling as many as 150 specialized remediation wells, and operational and maintenance activities than any other alternative, creates a higher risk and adverse impacts to workers, community and the environment than any other alternative. Alternative 6 has lower ratings for the short-term effectiveness comparative analysis than any other alternative. As per Table II-3-5 of the Feasibility Study Report, Alternative 6 was rated as having a high short-term effectiveness, which was just from its ability to remediate the groundwater, not from its adverse impact that may be create for workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved. In addition, Alternative 6 had the best short-term effectiveness rating for reducing contamination in the vadose zone of the A-zone only. The short-term effectiveness of the B-zone groundwater extraction and treatment component is limited to very marginal improvement in the B-zone groundwater conditions and could be counter productive if implemented before the A Zone remedy is complete. The Proposed Plan evaluation for the short-term effectiveness included appropriate evaluation for any adverse impact during implementation of the remedy, in addition to its ability of alternatives in cleaning up contaminants. EPA, in the Proposed Plan, presented a summary of more comprehensive information.

Comment #9.2.b. Risk Assessment Analysis

The risk assessment failed to address risk to on-site children. This failure is a departure from EPA's earlier risk assessments which identified and considered children trespassers and young adult trespassers as potential receptors. The site is a large, clear asphalt area, protected only by a chain link fence. There is little visual indication that the site presents any health risk. Many residents were not aware that the site existed until very recently. These conditions, in a town without many neighborhood parks, can be very

inviting for children and teenagers. The RI/FS for OU-2 should have considered on-site children and young adults in its health risk assessment. These populations are clearly more sensitive to chemical contamination than any of the populations identified in the Proposed Plan. The failure to consider them, especially since they had been identified as potential receptors earlier in this same process, is a dangerous oversight and should be remedied immediately.

RESPONSE:

The Site has been secured with appropriate security measures. Currently a 7.5-foot fence, 6-foot high chain link fence with 3-strands of barbed wire, with a locked gate surrounds the perimeter of the Site. Warning signs are also posted at the B&B Site. Due to the caps and fencing it is not reasonable to expect any exposure to children or young adults from this Site; therefore, the risk assessment does not include this pathway.

Comment #9.2.c. Failures to Address

The Proposed Plan fails to address 1) on-going soil contamination; 2) earthquake effects on the Corcoran clay layer and the RCRA cap; 3) RCRA cap cracks and on-site rodent holes; 4) security of wells which were recently found unlocked and open; and 5) health assessments based on Arvin public health records. Each of these issues should have been included in the RI/FS and Proposed Plan. The EPA should address each of these issues before releasing a final ROD.

RESPONSE:

Sources of surface contamination, such as surface soils, tanks, sumps and ponds, have been addressed in past actions. EPA has removed all surface contamination at the B&B site with three removal actions during the 1990's. With the removal of the surface contamination sources, ongoing soil contamination has been ceased.

The Arvin area has known faults zone in the proximity of the B&B site. No significant impact to the Corcoran clay layer is expected from seismic activity. There was a magnitude 5.0 earthquake 17.1 miles East of Arvin on September 29, 2004. Following this event, water levels in all wells were measured and compared to the January 2004 groundwater sampling event. Water levels in each well were nearly identical showing that there was no impact on the groundwater at or near the site from this event.

The Site O&M includes periodic inspections for repairs and maintenance, and necessary repairs and maintenance are conducted to maintain effectiveness of the surface soil caps. This includes periodic removal of weeds and windblown trash and dirt. The RCRA and non-RCRA caps are currently scheduled to be repaired in the Fall of 2007. An inventory of all well deficiencies to include locking well caps and concrete bollards has been compiled and a contract is currently being written to address these maintenance needs.

The Site OU-2 health assessment did not include any Arvin public health records because there has been no exposure to the public from the groundwater contaminated from the Site COCs.

Comment #9.3 Community Involvement Failures

In enacting superfund laws, the U.S. legislature recognized the importance of public involvement in the development of toxic clean-ups within communities. To comply with CERCLA and SARA, the EPA has committed itself to "advocate and strengthen early and meaningful community participation during

Superfund cleanups."[13] *To achieve this, EPA staff should: 1) Keep the community well informed of ongoing and planned activities, 2) Encourage and enable community members to get involved, 3) Listen carefully to what the community is saying, 4) Take the time needed to deal with community concerns, 5) Change planned actions where community comments or concerns have merit, and 6) Explain to the community what EPA has done and why.*

Unfortunately, EPA had failed to keep the community involved or informed during the EPA's 23-year involvement in the project. Community members and the Arvin city government were unaware of plans to clean up the groundwater until outside non-profit organizations informed them. While EPA has improved its community involvement over the last few months, the EPA still is failing to meet the community involvement requirements of CERCLA.

RESPONSE:

EPA has a long history of attempting to involve interested members of the community. EPA tried to engage members of the community even before this site was included on the National Priorities List (NPL). EPA has issued numerous fact sheets throughout the major milestones for the Site and all facts sheets were translated into Spanish.

EPA has carried out extensive community participation for the B&B Site Proposed Plan process. EPA distributed the Proposed Plan fact sheets to individuals on the mailing list, which consisted of over 900 addresses. Two public meetings were conducted, June 21, 2007 and August 9, 2007, during the public comment period in the City of Arvin where the proposed plan was presented and comments were accepted from the public. The notice of the June 21, 2007 public meeting was published in the *Bakersfield Californian* on June 14, 2007, and in Spanish language in *El Popular* on June 15, 2007. The notice of the August 9, 2007 public meeting was published in the *Arvin Tiller* on August 1, 2007, in the *Bakersfield Californian* on August 3, 2007, and in Spanish language in *El Popular* on August 3, 2007. All materials, including the Proposed Plan Fact Sheet and meeting discussion were held in both English and Spanish. An EPA representative went door to door on August 8, 2007 handing out the Site fact sheet. Public comment period was extended from 30 days (June 21, 2007 to July 21, 2007) to 67 days (June 21, 2007 to August 28, 2007). Extensions of public comment period were published in the *Arvin Tiller* on July 25, 007 and August 22, 2007; in the *Bakersfield Californian* on August July 21 and August 24, 2007; and in Spanish language in the *El Popular* on July 20, 2007 and August 24, 2007. EPA always looks for ways to improve community participation for the Superfund site cleanup process, as intended by the U. S. Congress.

Comment #9.3.a. Community Outreach & Involvement

EPA has failed to outreach to the community. EPA attempted to hold its first public hearing in a small room in the Arvin Library with a capacity of about thirty people. The EPA's outreach for the hearing consisted of mailing notices to around 300-500 residents on its mailing list. The city has a population of over 15,000 residents. The mailed notice was received by most recipients the day after the hearing took place. The EPA has consistently refused to expand its mailing list to include all households in Arvin. The residents of Arvin have now overwhelmingly demonstrated their interest in all decisions concerning the site. EPA recently received 7,000 signatures from Arvin residents asking for a complete clean-up. If a committee of local volunteers can manage to outreach to an entire city, the EPA should be able to manage sending out notices to all households.

RESPONSE:

EPA notified the community by placing public notices in the local newspapers (*Bakersfield Californian* and *El Popular*) of greatest circulation throughout the area. EPA mailed the Proposed Plan fact sheets to individuals on the mailing list, which consisted of over 900 addresses. The mailed fact sheets did arrive later than expected, however they did not fail to inform residents about site related issues and critical dates of the public comment period.

EPA appreciates the work of the numerous volunteers who helped to generate interest in the Site. EPA looks forward to working with concerned members of the community.

Comment #9.3.b. Translation

According to the 2000 Census, Arvin's population is nearly 90 percent Hispanic. As EPA is well aware, the majority of Arvin residents speak Spanish, and many of them are monolingual Spanish speakers. While EPA has provided a few notices about Brown & Bryant in Spanish, all substantive documents have been provided in English only. Because of the high interest in the Brown & Bryant site from many monolingual Spanish speakers, CRPE and CBA have requested EPA to translate certain documents into Spanish. The EPA eventually agreed to translate the 18-page Proposed Plan into Spanish. However, the EPA also informed CRPE and CBA that the document would not be available until the day after the public hearing, the community's primary means of commenting on the project. Though the document was promised to be delivered by August 10, we did not receive a copy of the translation, nor any explanation of why the translation was late, until August 23. The deadline for written comments will likely pass with a large percentage of the population of Arvin having never had a chance to read the document they have been asked to comment on.

The translation issue has been poorly handled in the past. For example, the Second Five-Year Review Report indicated that site investigators attempted to interview local residents but failed to do so because the residents did not speak English and the investigators did not have a translator.[16] In all, the investigators were able to interview only two residents. When EPA conducts future site inspections, it must ensure that a translator is present. Additionally, EPA should make a better effort to receive feedback from a wide range of residents, including those who are migrant farm workers and those who speak only Spanish. Their health is at risk, the same as every other resident of Arvin.

RESPONSE:

EPA will continue to translate all the Brown & Bryant Fact Sheets. EPA will provide translation services at EPA public meetings. Translations are time and resource consuming. EPA does not have the resources to translate every technical document.

Comment #9.3.c. Local Repository

The EPA is required to make the administrative record available to the public at or near the Superfund site at issue. EPA selected the Kern County Library, Arvin Branch to be the local repository for the administrative record. Despite EPA's insistence that the record for this case is quite extensive, the Arvin library still contains only a few documents. Apparently, since I asked the EPA to update the local repository, the agency has added a binder with public notice documents from the first ROD in the early 1990s. The library still does not contain the Remedial Investigation/Feasibility Study on which this Proposed Plan is based. The large size of the administrative record does not excuse EPA from its statutory duty to make the documents available to the public at a local repository. The Arvin Library has indicated to

me that it has the capacity to hold the administrative record, especially if it is provided in an electronic format. The head librarian for the Arvin Branch has indicated that a hard copy for most of the material will also be appreciated, as many residents are not comfortable using a computer.

There is also significant confusion about where the local repository is located. According to the Second Five-Year Review Report, the administrative record was relocated to the Beale Library in Bakersfield, though librarians in the Arvin Library and the Beale Library could not confirm this. Nonetheless, the EPA should provide the same documents to the Kern County Beale Memorial Library in Bakersfield under authority granted by 42 U.S.C. § 9613(k)(1).

RESPONSE:

EPA acknowledges that the administrative record in the Arvin Library is in disarray and has been working with the Kern County Library to address this issue. However, public libraries have limited resources, space and staff members to guard documents. EPA can establish the Beale Library in Bakersfield, California as a second information repository and submit all future documents to both.

The Arvin Branch Library does contain the OU-2 RI/FS on a CDROM. EPA mailed this CDROM to the library and has confirmed that the Arvin Branch Library received it.

Comment #9.3.d. TAG Grants

Congress made public involvement in decision making an important part of the Superfund process when the program was established in 1980. Congress wanted to ensure that the people whose lives were affected by abandoned hazardous waste sites would have a say in actions to clean them up. To strengthen the Community's role in decision-making, Congress has established a technical advisory grant for community groups to contract with independent technical advisors to interpret and help the community understand technical information about their site.

However, in an audit performed by the Office of the Inspector General, the EPA was found to be systematically failing to inform community groups about the availability of the grants. This requirement is found both within the National Contingency Plan and the statute itself. In Arvin, as in many other communities, EPA has failed to perform its mandatory duty to inform the community of its eligibility to receive this grant. The most disturbing aspect of EPA's failure is that members of CBA specifically asked EPA if the agency could provide money for an independent assessment of EPA's work.

Regardless of EPA's negligence, CBA now asks for EPA's assistance in obtaining the TAG grant. While the grant will be a useful tool for the CBA to understand what the EPA has done and will do at the site, the purpose of the TAG grant has effectively been thwarted by waiting until the comment period has closed to start the TAG process. This could and should have been prevented.

RESPONSE:

EPA did not include information about the TAG program in the recent proposed plan fact sheet. However, EPA has advertised the Technical Assistance Grant in EPA's fact sheets since the Site was listed on the NPL. This is the first request from the community for a TAG on this Site. EPA will work with the taskforce through the application process for a TAG. Although EPA is in the Record of Decision process, the Arvin community can continue to be a part of the remediation process.

Comment #9.4 Conclusion

CRPE and CBA have been frustrated by EPA's handling of the Brown & Bryant site. EPA's long inaction has contributed to the contamination of the site; the EPA's preferred alternative does not directly remediate all contamination; the EPA has failed to follow community involvement requirements; and the EPA has mislead and misinformed the public. It is our sincere hope that EPA does not routinely take such a dangerous and disrespectful approach to cleaning sites and engaging the public. However, we are hopeful that the community has persuaded the EPA to take a second look at the remedial alternatives and the manner in which it involves the community to develop a better remediation plan, and a better relationship with Arvin residents. Thank you for the opportunity to comment.

RESPONSE:

EPA has taken all appropriate actions to mitigate and eliminate any threat to human health and the environment from contamination at the B&B Site based on extensive investigations. EPA's preferred/selected alternative addresses all contamination at the Site. The selected remedy includes appropriate monitoring, review and evaluation requirements to ensure that it is protective of human health. It is EPA's intent to involve community participation during remedy selection process, and select an appropriate remedy to protect human health and the environment.

COMMENT #10

The Shell Chemical Company (Shell) submitted written comments to the B&B Site Proposed Plan. The comments and response are presented below:

- *To date, the City of Arvin Well No. 1 has not been impacted and based on an evaluation performed by the USCOE, the plume is not expanding. Therefore, Shell proposes implementation of a groundwater quality monitoring program for this well as opposed to well abandonment and replacement (which is estimated to cost $985,000). Relocation of the current well does not guarantee a clean water source for the City.*

RESPONSE:

Based on monitoring data, EPA agrees that to date, the City Well CW-1 has not been contaminated above MCLs. The groundwater monitoring indicates that the B-zone groundwater plume may be migrating slowly in the direction of the Arvin City Well CW-1. Arvin City Well CW-1 is completed in the C-zone aquifer that is hydraulically separated from the B-zone by the Corcoran Clay layer. The well construction data indicate that the annular space of the Well CW-1 may be gravel packed and is not sealed off through the B-zone, which could provide a conduit for cross contamination. Arvin City Well CW-1 is at a risk of contamination from the Site COCs, and should be abandoned and replaced as soon as possible to eliminate potential risk to human health and the environment. EPA will maintain groundwater quality monitoring for this well until it is properly abandoned and replaced. Abandonment of the Arvin City well CW-1, or any other well that could be a conduit for cross contamination of the C-zone aquifer guarantees a clean water source for the City of Arvin. Currently, the C-zone aquifer is not impacted and is hydraulically separated from the B-zone by the Corcoran Clay layer.

- *Aerial photography since 2000 confirms that the northern portion of the Site is impacted by runoff from the property located to the east. This observation was also confirmed by the USCOE during performance of their second Five Year Review, in which they identified ponding and cracks in the asphalt in the non-RCRA cap are. The Preferred Alternative does not include a component for*

eliminating surface water run-on and/or infiltration into the sub surface. Implementation of this program would eliminate surface water infiltration in this area, reduce the quantity of water into the A-zone water bearing unit, and may eliminate the need for installation of the proposed recovery wells/sumps.

RESPONSE:

Maintenance of the asphalt of the non-RCRA cap is an O&M part of the OU-1 selected remedy. The USCOE identified the repairs (cracks and ponding) for the cap, and is performing necessary repairs for maintenance of the cap for its effectiveness, which includes elimination of surface water infiltration in this area to avoid further contamination of water in the A-zone water bearing unit. However, dewatering of the impacted A-zone groundwater is necessary to avoid continued contamination of the B-zone groundwater.

- *Based on site lithology, the presence of dense non-aqueous phased liquids (DNAPL) and historic groundwater levels, the groundwater recovery rate of 15 to 150 gallons per day is optimistic. If a conservative constant influent concentration of 5 milligram per Liter (mg/L) is assumed for 1,2-DCP, only 275 gallons of 1,2-DCP may be removed in ten years (assuming the stated optimistic recovery rate). This recovery rate will equate to up to $57,000 per gallon of 1,2-DCP. In addition, it is highly unlikely that this removal rate will remediate the A-zone aquifer to the proposed cleanup levels of between 0.050 to 0.500 mg/L. EPA has countless examples of failed pump and treat remedies at sites contaminated with DNAPL. Despite EPA' s best intentions, the Arvin site will not be an exception to the rule. Apart from the technical difficulties involved in implementing this pump and treat remedy, the benefit in terms of risk reduction is highly questionable. The intervening soil layer between the A-Zone and B-Zone groundwater units has been shown to provide an effective hydraulic barrier, serving to reduce constituent concentrations by a very significant factor. Given the very limited hydraulic communication between these two units, reducing concentrations in A-Zone groundwater, even if it were to prove technically feasible, cannot be expected to result in a significant reduction in concentrations in B-Zone groundwater. Rather, monitored natural attenuation will serve to manage both A-Zone and B-Zone groundwater concerns without any pumping and treatment of A-Zone groundwater.*

RESPONSE:

The RI did not find any dense non-aqueous phased liquids (DNAPL) in the subsurface at the B&B Site. The 15 to 150 gallons per day of water extraction from the A-zone was estimated based on the remedial investigations conducted at the Site. It may be optimistic for long-term recovery as the remedy is anticipated to reduce groundwater levels in the A Zone. Removal of 275 gallons of 1,2 DCP is a significant reduction of volume and toxicity of the contamination from the groundwater as it could contaminate about 60 billion gallons of water at the MCL of 5 µg/L. COC concentrations that are significantly above the MCLs in the B-zone groundwater demonstrates that the layer between the A-Zone and B-Zone groundwater units is not an effective hydraulic barrier between A-zone and B-zone. EPA agrees that the natural attenuation process will attenuate groundwater COCs to some degree. However, the MNA will not attain the COC concentration in the B-zone groundwater, the point of compliance, to MCLs as long as the source of contamination, the A-zone contaminated groundwater, is not eliminated or controlled. The Site fate and transport model indicates that once the vertical migration of A-zone impacted groundwater is eliminated or controlled, the natural attenuation processes are expected to reduce the COC groundwater concentrations in the B-zone groundwater to the cleanup levels within a reasonable timeframe. Therefore, extraction and treatment of the impacted A-zone groundwater is necessary to meet the remedial action objectives.

Shell proposes that a modified Alternative 2 be selected for implementation at the Site. The program would include the following:

- *Implementation of a groundwater quality monitoring program for City Well No. 1.*
- *Improvement of surface water flow to eliminate run-on onto the northern portion of the Site, which would include re-grading and re-sealing the existing non-RCRA cap.*
- *Implementation of a MNA program for the A- and B-zone water-bearing units.*
- *Institutional controls, including deed and zoning restrictions, permit requirements, and public education.*

RESPONSE:

Based on the remedial investigation at the B&B Site, risk of contamination to the Arvin City well CW-1 is possible due to well construction, the well should be abandoned and relocated to eliminate risk to human health and the environment. EPA will maintain a groundwater quality monitoring for the Well CW-1 until it is appropriately abandoned.

Any repairs and maintenance, including necessary re-grading and re-sealing of the RCRA and non-RCRA caps will be conducted as a part of the OU-1 O&M remedy to maintain effectiveness of their intended function of eliminating any ponding and infiltration of water.

The preferred/selected remedy includes MNA (Alternative 2) for addressing the B-zone groundwater. As indicated in response to a previous comment, extraction and treatment of the A-zone groundwater, a source of contamination to the B-zone groundwater, is necessary to attain MCLs in the B-zone groundwater. The preferred/selected remedy includes institutional controls, including deed and zoning restrictions and/or permit requirements, to prevent any exposure to human health and the environment from the Site COCs.

In summary, Shell believes that it is of critical importance for EPA to select a cost effective and efficient remedial action that will achieve the Remedial Action Objectives.

RESPONSE:

EPA agrees that it is important to select a cost effective and efficient remedial action for the Site that will achieve the remedial action objectives. The identified remedial alternatives were evaluated in detail with respect to the nine evaluation criteria developed by EPA, which includes cost, to assure that the preferred/selected remedy is cost effective.

PART 4 ADMINISTRATIVE RECORD FILE INDEX

List of documents used from the Site Administrative Record File to prepare the Operable Unit-2 Record of Decision.

- Remedial Investigation Work Plan, Brown & Bryant Facility, Arvin, California, Hargis and Associates, Inc. June 17, 1987.
- Phase I- Investigation Report Arvin and Shafter Facilities, Kern County California, prepared for Brown & Bryant, Inc., Arvin and Shafter, California, Canonie Environmental, November 1987.
- Project Work Plan, Brown & Bryant, Arvin Facility, Superfund Site, First OU, Phase II. Prepared for the USACE, Morrison Knudsen Corporation, Inc., September 1998.
- Remedial Investigation/Feasibility Study Report, First Operable Unit — Source Control, Brown and Bryant Superfund Site, Arvin California, USEPA Region IX, 28 May 1993.
- Remedial Investigation/Feasibility Study Work Plan: Groundwater Operable Unit, Brown &Bryant. Arvin, California, August24, 1993.
- First Operable Unit Record of Decision, Brown and Bryant Superfund Site, Arvin California, United States Environmental Protection Agency Region 9, San Francisco, California, November 8, 1993.
- Closure Report Brown and Bryant Arvin Facility Superfund Site, First Operable Unit Remedial Action, Arvin, California, Morrison Knudsen Corporation, July 2000.
- Final Remedial Investigation/Feasibility Study of Remedial Alternatives, Brown and Bryant Superfund Site, Arvin, California, Panacea, Inc, September 2005.
- November 2005 Monthly Groundwater Sampling and Analysis Report for Brown and Bryant Superfund Site, Arvin California, Panacea, Inc, December 29, 2005.
- Second Five-Year Review Report for Brown and Bryant Superfund Site, Arvin, California, U.S. Environmental Protection Agency, Region 9, San Francisco, California, August 22, 2006.
- Monitoring Well Installation Report for PWB-7A and PWB-12, Brown & Bryant Superfund Site, Arvin, California, Panacea, Inc., February 2007.
- Soil Vapor Report, Brown & Bryant Superfund Site, Arvin, California, Panacea, Inc., March 2007.
- Proposed Plan, Brown & Bryant Superfund Site Operable Unit No. 2, City of Arvin, Kern County, California, United States Environmental Protection Agency, Region 9, San Francisco, California, June 2007.
- August 2007 Groundwater Monitoring Report, Brown and Bryant Superfund Site, Arvin, California, Eco and Associates, Inc., September 2007.